

MY GARBAGE

Module 1

MY GARBAGE

An Exploration of Solid Waste

Master Materials List	M1-1m
Nevada Standard Alignment	M1-1s
References	M1-1r
Lesson 1 – Just a Dream <i>Environmental Intro Using Van Allsburg’s <u>Just A Dream</u></i>	M1-3
Lesson 2 – It’s the Old Style <i>Landfill-Municipal Solid Waste</i>	M1-13
Lesson 3 – My Landfill is Sanitary <i>Landfill-Municipal Solid Waste</i>	M1-45
Lesson 4 – How Long Does Trash Last? <i>Waste Decomposition</i>	M1-71
Lesson 5 – Potato Chip Dilemma <i>Reduce</i>	M1-89
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Module 1

Master Materials List

Student workbooks are used for every lesson. In nearly every lesson the white board and dry erase markers are used. Should you be inclined, transparencies can be made and used on an overhead projector with water based markers.

1	<u>Just a Dream</u> by Chris Van Allsburg
1	<u>The Dumpster Diver</u> by Janet S. Wong
14	2L plastic soda bottles (the same bottles will be used for lessons 2 & 3) Remove the labels.
1	X-Acto knife
1	Pair nylon hose
1	Permanent marker
28	Cotton balls
14	Cups shredded paper
28	Cups soil
14	Rubber bands
14	Cups water
1	Measuring cup
7	Reusable grocery bags
100	One gallon Zip-Lock bags (some of these can be reused)
7	Cups small aquarium gravel
1	Large block of modeling clay
1	Plastic trash bag
2	Square feet of nylon deck shade fabric (geotextile fabric)
7	Plastic straws
1	Roll paper towels
2	Large measuring bowls
1	Large bag potato chips (20oz)
20	Small bags potato chips (equal weight to the large bag)
10	Sandwich sized zip-lock baggies
10	Plastic reusable food containers
30	Pieces printer paper
30	Sets colored pencils / crayons
30	Magazines
30	Pieces 11 X 17 paper
30	Glue sticks
30	Scissors (student)



Nevada Standard Alignment

Lesson	Title	Topic	<u>Nevada</u> Science	<u>Nevada</u> Language Arts	<u>Nevada</u> Geography	<u>Nevada</u> Mathematics
1	Just a Dream	Introduction	N.5.B.2	2.5.1, 2.5.2, 2.5.3, 3.5.9, 7.5.1, 7.5.2, 7.5.5, 8.5.1, 8.5.2, 8.5.4	2.5.4, 5.5.1, 5.5.3, 5.5.4, 6.5.4	n/a
2	It's the Old Style	Landfills	N.5.A.6, N.5.B.2, E.5.A.4, E.5.C.3, E.5.C.5, L.5.C.2, L.5.C.3, L.5.C.4	7.5.1, 7.5.2, 7.5.3, 7.5.5, 8.5.1, 8.5.2, 8.5.4	2.5.4, 3.5.3, 3.5.5, 5.5.1, 5.5.3, 5.5.4, 6.5.4	1.5.8, 3.5.1
3	My Landfill is Sanitary	Landfills – Sanitary	N.5.A.6, N.5.B.2, E.5.A.4, E.5.C.3, E.5.C.5, L.5.C.2, L.5.C.3, L.5.C.4	7.5.1, 7.5.2, 7.5.3, 7.5.5, 8.5.1, 8.5.2, 8.5.4	2.5.4, 3.5.3, 3.5.5, 5.5.1, 5.5.3, 5.5.4, 6.5.4	n/a
4	How Long Does Trash Last?	Waste Decomposition	N.5.A, N.5.A.1, N.5.A.2, N.5.A.3, N.5.B.2, N.5.B.3, L.5.C.2, L.5.C.3, L.5.C.4	7.5.1, 7.5.2, 7.5.3, 7.5.5, 8.5.1, 8.5.2, 8.5.4	2.5.4, 3.5.3, 3.5.5, 5.5.1, 5.5.3, 5.5.4, 6.5.4	5.5.1
5	Potato Chip Dilemma	Waste Reduction	N.5.A.3, N.5.B.2, L.5.C.3	7.5.1, 7.5.2, 7.5.3, 7.5.5, 8.5.1, 8.5.2, 8.5.4	2.5.4, 4.5.6, 5.5.1, 5.5.3, 5.5.4, 6.5.4	n/a
6	Play It Again, Sam	Material Re-Use	N.5.B.2	4.5.7, 5.5.1, 5.5.3, 5.5.4, 5.5.5, 5.5.7, 6.5.7, 7.5.1, 7.5.2, 7.5.3, 7.5.5, 8.5.1, 8.5.2, 8.5.4	2.5.4, 4.5.6	n/a
7	Warhol Waste	Assessment	Assessment	Assessment	Assessment	Assessment
8	Warhol Waste (part 2)	Assessment	Assessment	Assessment	Assessment	Assessment



Module 1

MY GARBAGE

References

Lesson 1 – Just a Dream

Van Allsburg, Chris. (1990). *Just a Dream*. New York: Houghton Mifflin.

Houghton Mifflin Company. (2008). *A Teacher's Guide: Just a Dream by Chris Van Allsburg*. Retrieved April 9, 2008, from <http://www.houghtonmifflinbooks.com/features/thepolarexpress/tg/dream.shtml>

White, Marilyn. (2008). "We have met the enemy... and he is us.". Retrieved April 9, 2008, from http://www.igopogo.com/we_have_met.htm

Lesson 2 – It's the Old Style

Nevada Division of Environmental Protection. (2007). *State of Nevada Solid Waste Management Plan 2007*. Retrieved May 28, 2008 from <http://ndep.nv.gov/bwm/swmp/swp06.htm#sec2.5>

The Nevada State Demographer's Office. (2007). *Nevada County Population Estimates July 1, 1986 to July 1, 2007 Includes Cities and Towns*. Retrieved May 28, 2008 from http://www.nsbdc.org/what/data_statistics/demographer/pubs/docs/Popul_of_Nevadas_Counties_and_Incorp_cities_2007_Time_Series_Email_021508.pdf

Oregon Department of Environmental Quality. (2001). *Lesson 05: Making A Model Landfill*. Retrieved May 28, 2008 from <http://www.deq.state.or.us/lq/pubs/docs/sw/curriculum/RRPart0305.pdf>

United States Environmental Protection Agency. (2003). *Recycle City: Landfill*. Retrieved May 28, 2008 from <http://www.epa.gov/recyclecity/landfill.htm#New>

Lesson 3 – My Landfill is Sanitary

Oregon Department of Environmental Quality. (2001). *Lesson 05: Making A Model Landfill*. Retrieved May 28, 2008 from <http://www.deq.state.or.us/lq/pubs/docs/sw/curriculum/RRPart0305.pdf>

United States Environmental Protection Agency. (2003). *Recycle City: Landfill*. Retrieved May 28, 2008 from <http://www.epa.gov/recyclecity/landfill.htm#New>

Lesson 4 – How Long Does Trash Last?

Hopkins, Gary. (2003). *How Long Does Trash Last? (A Cooperative Learning Activity)*. Retrieved April 8, 2008 from http://www.educationworld.com/a_lesson/03/lp308-04.shtml

Rathje, W. L., & Murphy, C. (1992). *Rubbish!: the archaeology of garbage*. New York, NY: HarperCollins.

Lesson 5 – Potato Chip Dilemma

American Plastics Council. (1993). *The Potato Chip Dilemma: A Lesson About Source Reduction. 4 Classroom Activities on Plastics and Solid Waste Management*. 11-13.

Lesson 6 – Play It Again, Sam

Wong, Janet S. (2007). *The Dumpster Diver*. Cambridge: Candlewick.

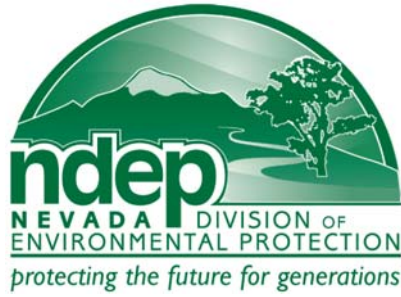
Candlewick Press. (2007). *The Dumpster Diver: An Activity Guide*. Retrieved April 9, 2008, from http://www.candlewick.com/book_files/0763623806.mis.1.pdf

Lesson 7 – Warhol Waste

No works referenced for this lesson.

Lesson 8 – Warhol Waste

Discovery Education. (2007). *Discovery Education's Puzzlemaker*. Retrieved May 29, 2008 from <http://puzzlemaker.discoveryeducation.com/>

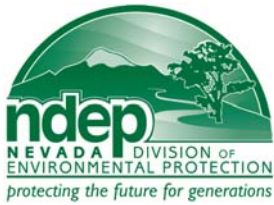


Lesson 1

Just a Dream

Based on a book by Chris Van Allsburg

Support Document	Teaching Strategies	M1-5
Lesson 1	Read-Aloud	M1-7
Support Document	Guided Questions	M1-10
Support Document	Student Worksheets	M1-11



Solid Waste & Recycling Curriculum

Lesson 1

Teaching Strategies

Just a Dream

Based on a book by Chris Van Allsburg

Teaching Strategies

Read-Aloud

This strategy is effective for all levels of learners.

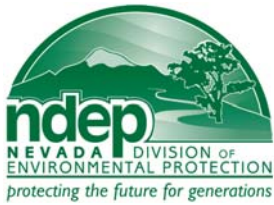
Think-Pair-Share

This strategy is effective for all levels of learners.

Discussion questions

For below level learners and special ed, the teacher may consider grouping the students together. Read the questions aloud and discuss. Help them put their thoughts on paper.

Tip: The student worksheet can be made as a transparency for group discussion.



Solid Waste & Recycling Curriculum

Lesson 1

Lesson Time:
60 minutes

Just a Dream

Based on a book by Chris Van Allsburg

“We have met the enemy and he is us.”
--Pogo

The quote is taken from the publication page of Just a Dream by Chris VanAllsburg.

Objective

Students will be able to determine how an individual's actions are related to the world around them.

Materials Needed

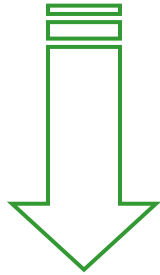
30	Workbooks (or handouts)
1	<u>Just a Dream</u> by Chris Van Allsburg
1	White board
1	Set of dry erase markers

Anticipatory Set

Write the lesson objectives on the white board.
Discuss with the students what the objectives of the lessons are.

Objective: You will be able to tell how your actions affect the world around you.

Distribute handouts (or workbooks).



Introduction:

“We are going to start our study of waste and recycling by reading a picture book called Just a Dream by Chris Van Allsburg.”

Perform a quick book walk by showing the illustrations and asking for predictions.

Modeling / Guided Practice

1. Teacher Read-Aloud.

- A. Pause after the scene of Rose watering her tree. Ask the following question of the class:

What do you think of the way Walter tosses his wrappers on the ground and makes fun of Rose's tree?

- B. Using the think-pair-share strategy, have the students discuss the following question:

What does this behavior tell you about Walter's character?

- C. As you read the story, pause at several scenes in Walter's dream journey to draw attention to issues of technology.

- D. Using the think-pair-share strategy, ask the students to predict the outcome of the story. (Conflict / Resolution)

Modeling / Guided Practice

2. When the read aloud is done, have the students focus their attention on the handouts (workbook).
3. With teacher support, have the students complete the discussion questions.
4. If time permits, discuss as a group.

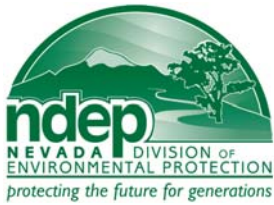
Closure:

1. Using the think-pair-share strategy, have the students answer the following question:

“How do your actions affect the world around you?”

Independent Practice

1. Not applicable for this lesson.



Solid Waste & Recycling Curriculum

Lesson 1

Support Document

Just a Dream

Based on a book by Chris Van Allsburg

Guided Questions

After the scene with Rose watering her tree:

What do you think of the way Walter tosses his wrappers on the ground and makes fun of Rose's tree? What do these behaviors tell you about Walter's character?

As you read the story to your students, pause at several scenes in Walter's dream journey and discuss the issues described.

This is a good time to also discuss the issues of technology.

Ask the students to predict how the story will end. Conflict / Resolution

When the read aloud is complete:

Walter's ideas change over the course of the story. What does he learn from the dream? Does his character change?

Have the students describe how technology has had an impact on the story, both good and bad.

Closure question:

"How do your actions affect the world around you?"

Objectives: I will be able to describe how my actions are related to the world around me.

Discussion questions:

Walter's ideas change over the course of the story.

What does he learn from the dream?

Does his character change?

Describe how technology has had an impact on the story, both good and bad.

Solid Waste and Recycling Curriculum

Lesson 1

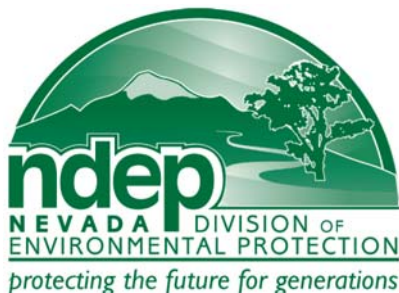
Just a Dream

Name:_____

Date:_____

Closure question:

“How do your actions affect the world around you?”



Lesson 2

It's the Old Style

Landfill

Support Document	Getting the materials ready	M1-15
Support Document	Teaching Strategies	M1-21
Lesson 2, part 1	Lecture	M1-23
Lesson 2, part 2	Lecture / Lab	M1-26
Support Document	Vocabulary	M1-30
Support Document	Leading Questions	M1-31
Support Document	Calculations	M1-32
Support Document	Layers of a Landfill	M1-34
Support Document	Daily Cover	M1-35
Support Document	Water Flow Issues	M1-36
Support Document	Homework Key	M1-37
Support Document	Student Worksheets	M1-39

**Support
Document**

It's the Old Style

Landfill

Support Document

Preparing materials for making the landfill.

Materials Needed

14	2L plastic soda bottles Remove the labels.
1	Scissors or X-Acto knife
1	Pair nylon hose
1	Marker
14	Cotton balls
7	Cups shredded paper
14	Cups soil
7	Rubber bands
7	Cups water
1	Measuring cup
7	Reusable grocery bags
28	One gallon Zip-Lock bags

For a class size of 30, prepare kits for 7 landfill columns.

The class will be divided into 6 groups of 5.

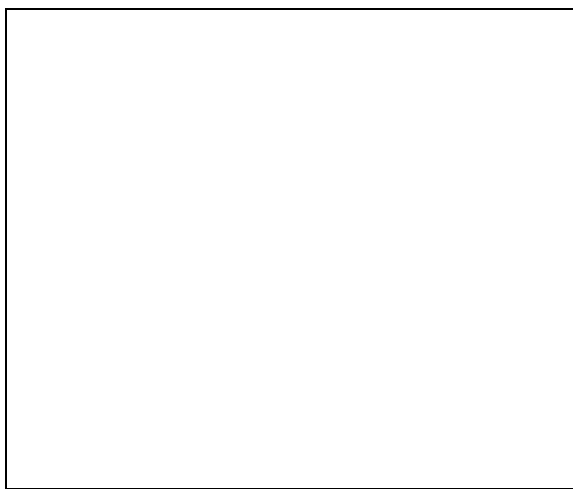
The 7th landfill will be made by the teacher (as a demonstration).

Preparing the plastic soda bottles for the landfill model

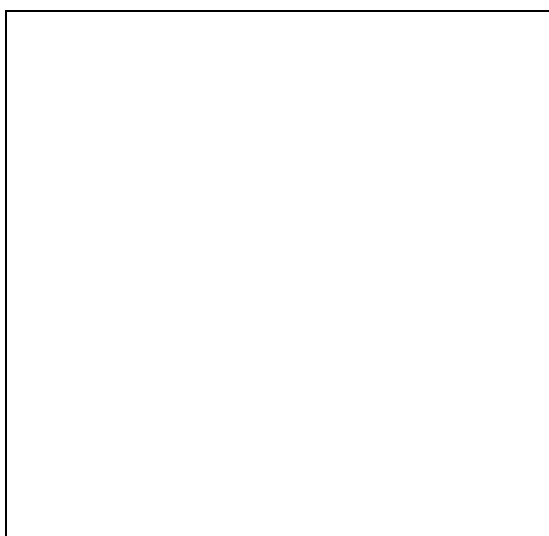
Pre-class Prep:

Bottle #1 Prep

1. Mark just below the taper where the bottom cut will be made.

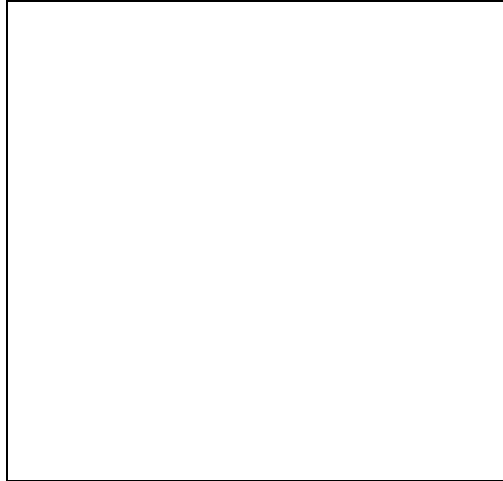


2. Use the scissors or X-Acto knife to cut the bottom off of the first bottle.
3. Write #1 on the finished product.

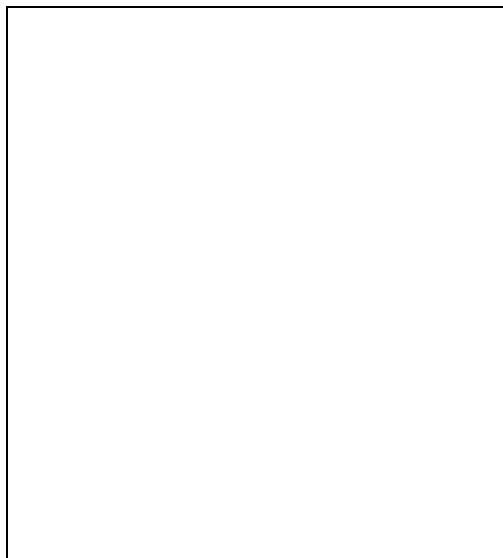


Bottle #2 Prep

4. Mark slightly above the midpoint where the bottom cut will be made.



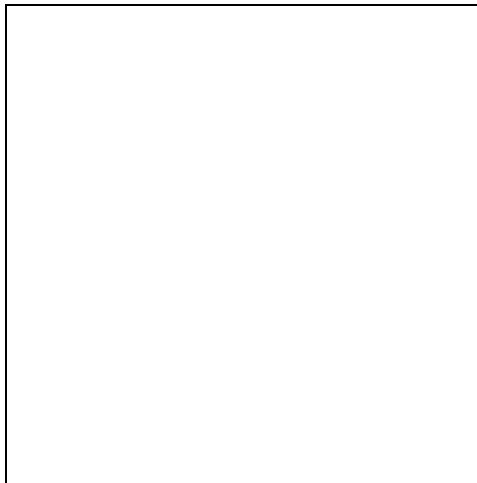
5. With the scissors or X-Acto knife, cut the bottom off.
6. Write #2 on the finished product.



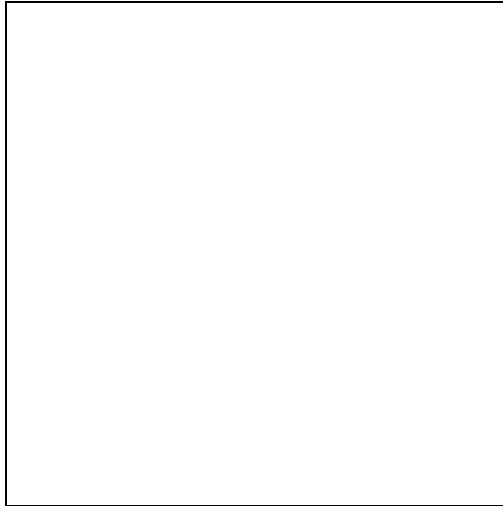
7. Cut the nylon hose into 2" squares.



8. Place 2 cotton balls into the neck of bottle #2.
9. Using the rubber bands, attach the nylon squares to the neck of bottle #2.



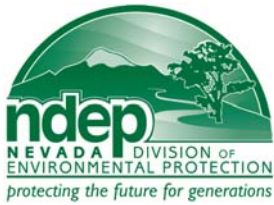
10. Assemble the two plastic bottles into the shape of a column.



Prepare the contents of the landfill column

11. Measure 1 cup of shredded paper into each of 7 Zip-Lock bags.
12. Measure 1 cup of water into each of 7 Zip-Lock bags.
13. Measure 1 cup of soil into each of 14 Zip-Lock bags.

14. Prepare the individual kits by placing the following items in each reusable grocery bag:
- 1 Landfill column
 - 1 Bag of shredded paper
 - 1 Bag of water
 - 2 Bags of soil



Solid Waste & Recycling Curriculum

Lesson 2

Teaching Strategies

It's the Old Style

Landfill

Teaching Strategies

Lecture

This strategy is effective for all levels of learners.

During the lecture, an alternative may be to use the overhead (use student worksheet as a transparency)

Worksheets

Worksheets are provided to guide the students through the lesson. The lead teacher may prefer to have the students to take their own notes.

For below level learners and special education students, the teacher may consider having the worksheets filled out for these students. This would be done before class by the teacher or by having an advanced student help.

Group Makeup

Groups should be selected by the lead classroom teacher. The groups should be heterogeneous and learners of all levels should be included.

Group Discovery

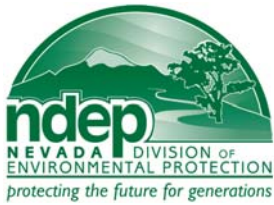
The group work is effective for all levels of learners

Homework questions

Most elementary classrooms have a computer class scheduled as a "special". If you provide the [Recycle City](#) link to the computer teacher, class time may be allotted for internet use.

Handouts of printed copies of the Recycle City information contain the same information as the website. If internet use is not available, please use the printouts.

Tip: The student worksheet can be made as a transparency for group discussion.



Solid Waste & Recycling Curriculum

Lesson 2 Part 1

Lesson Time:
30 minutes

Vocabulary

Municipal Solid Waste

Landfill

Transfer station

Per capita

It's the Old Style

Landfill

10 lbs.

The average weight of MSW the average Nevadan disposes of each day.

Nevada Division of Environmental Protection. (2007). *State of Nevada Solid Waste Management Plan 2007*. Retrieved May 28, 2008 from <http://ndep.nv.gov/bwm/swmp/swp06.htm#sec2.5>

Objective

Students will understand the “path” waste takes from consumer to landfill.
Students will be able to apply mathematical calculations to determine the amount of waste we produce.

Materials Needed

30	Single subject notebooks (student's)
6	Dry erase markers
1	White board

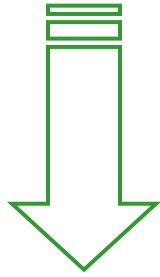
Anticipatory Set

Write the lesson objectives on the white board.
Discuss with the students what the objectives of the lessons are.

Objective: You will understand the path of waste from consumer to landfill.

Objective: You will be able to apply mathematical calculations to determine the amount of waste we produce.

Distribute handouts (or workbooks).



Introduction:

So, I was thinking about the things we throw away...then how they end up in a landfill.

Today at lunch (breakfast) what did you throw away? What went in the can?

Modeling / Guided Practice

1. Discuss what was thrown away during lunch (breakfast).
Include the types of trash and the types of packaging.
2. Ask some leading questions:
What happens to the trash after it goes in the garbage?
Who moves it?
How does it get in the garbage truck?
Where does the garbage truck take it?
Where does it ultimately end up?
3. Have a group discussion to answer the previous questions.
4. List the correct answers on the board. (see support documents)
5. Have the students write the statements in their notebooks.
6. Define MSW, landfill, transfer station, and per capita. (see support documents)

Modeling / Guided Practice

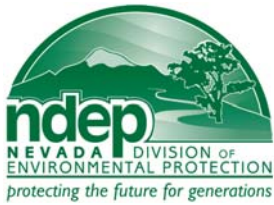
7. Discuss the amount of trash produced in Nevada per capita. (see support documents)
8. Calculate approximate weight of trash produced by:
 - Class
 - Reno
 - Sparks
9. Calculate approximate weight of trash produced per:
 - Day
 - Week
 - Month
 - Year

Closure:

1. Ask if the students understand how municipal solid waste “flows” from consumer to landfill.
2. Ask the students if they see any adverse impact on the environment. Use the think-pair-share strategy.

Independent Practice

1. Not applicable for this lesson. This flows into part 2 of lesson.



Solid Waste & Recycling Curriculum

Lesson 2 Part 2

Lesson Time:
30 minutes

Vocabulary

Leachate

Vector

Groundwater

It's the Old Style

Landfill

Lockwood Regional Landfill

Lockwood is Nevada's second largest active landfill. It is located just east of the city of Sparks in Storey County.

Objective

Students will understand the basic structure of a landfill.
Students will construct a model landfill.

Materials Needed

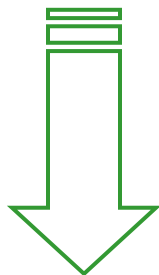
30	Single subject notebooks (student's)
6	Dry erase markers
1	White board
7	Landfill columns
7	Pre-filled kits in reusable grocery bags

Anticipatory Set

Write the lesson objectives on the white board.
Discuss with the objectives of the lesson.

Objective: You will understand the basic structure of a landfill.

Objective: You will construct a model landfill.



Introduction:

“So, we have followed the path of our trash (MSW) from the lunch room to the landfill. Now let’s take a look at the structure of a landfill.”

Modeling / Guided Practice

1. On the white board, draw the layers of the landfill (see support documents)
2. Have the students copy the landfill structure in their notebook.
3. Have the students assemble into their preselected groups of 5.
4. Pass out the prefilled reusable grocery bags.

Assemble the model landfill


5. Assemble the bottom of bottle #1 with the top of bottle #2 to form the structure of the landfill.
This is to show the students how the model will fit together.
6. Add 1 cup of soil to the model.
This represents the ground.
7. Have the students do the same.
8. Add shredded paper to the model.
This represents the MSW.
9. Have the students do the same.
10. Add 1 cup of soil to the model.
This represents the daily cover.
11. Have the students do the same.
12. Discuss the reasons for daily landfill cover. (see support documents)
13. Pour water into the landfill model.
14. Have the students do the same.
15. Discuss how the water can flow through the landfill.
16. Define leachate. Connect leachate with the flow of water through the landfill.
17. Discuss and define the vocabulary words.

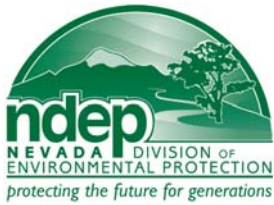


Closure:

1. Ask if the students understand how the landfill was made.
2. Ask if they understood the purpose of the lesson.

Independent Practice

1. Remind the students that part of the worksheet contains an assignment to be done outside of class.
- 



Support Document

VOCABULARY

It's the Old Style

Landfill

Vocabulary

Municipal Solid Waste: Trash (or garbage) generated by people and industry.

Landfill: A place where our MSW is buried. There are many different types of landfills, but they all bury trash.

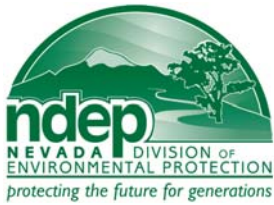
Transfer Station: A place where Municipal Solid Waste is collected prior to the waste going to a landfill. The city collection trucks bring the waste here to unload. The MSW is then reloaded onto a larger truck and sent to a landfill.

Per capita: Per person.

Leachate: The toxic liquid that seeps from the trash in a landfill. It is a potential groundwater contaminant.

Vector: Any animal or pest attracted to the garbage in landfills and spread disease.

Groundwater: The water that is under the ground. This water is commonly used as a drinking water source. It is important in this context due to the possible contamination by leachate.



Support Document

It's the Old Style

Landfill

Leading questions...

The answers to the discussion questions should be directed to the following "flow" of MSW:

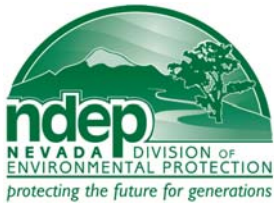
Lunchroom

Dumpster in
parking lot

Trash Truck

Transfer Station

Landfill



Solid Waste & Recycling Curriculum

Lesson 2

Support Document

It's the Old Style

Landfill

Support Document

The estimated amount of waste ending up in a landfill is 8 pounds per person, per day. This estimate is for Nevada and is above the national average of 4.5 pounds per person, per day.

Individual (1 person) * waste (8 lbs) = 8 lbs/person

Class size (30 people) * waste (8 lbs) = 240 lbs/class

Reno (206,735 people) * waste (7.2 lbs) = 1,653,880 lbs/Reno

Sparks (85,618 people) * waste (7.2 lbs) = 684,944 lbs/Sparks

1,653,880	lbs/Reno
+ 684,944	lbs/Sparks
<hr/>	
2,338,824	lbs/Reno+Sparks

Support Document

Use the value for waste produced in Reno for:

1 Day: $1,653,880 \text{ lbs} * 1 \text{ day} = 1,653,880 \text{ lbs}$

1 Week: $1,653,880 \text{ lbs} * 7 \text{ days} = 11,577,160 \text{ lbs}$

1 Month (30 days): $1,653,880 \text{ lbs} * 30 \text{ days} = 49,616,400 \text{ lbs}$

1 Year: $1,653,880 \text{ lbs} * 365 \text{ days} = 603,666,200 \text{ lbs}$

Data based on:

**Nevada Division of Environmental Protection's Solid Waste Management Plan 2005
and projected census data from 2005.**

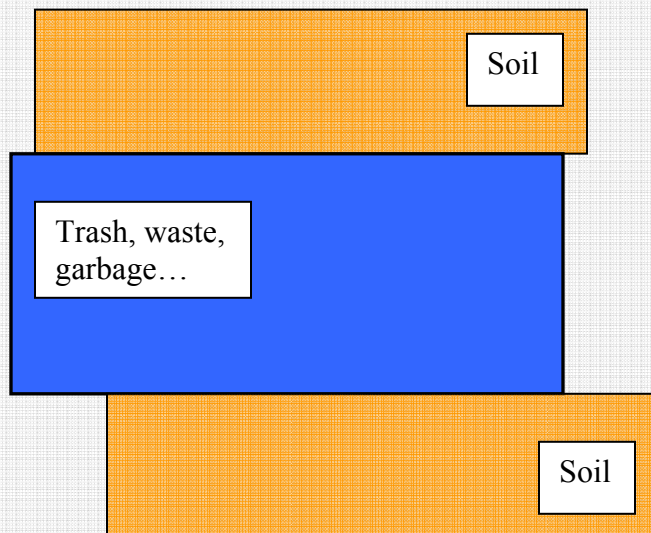
Support Document

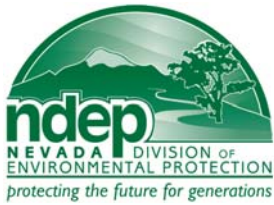
It's the Old Style

Landfill

Support Document

Layers of the Old Style Landfill





Support Document

It's the Old Style

Landfill

Reasons for daily cover:

Odor control

Fire Control

Vector control

Daily cover consists of 6 inches of dirt.

Support Document

It's the Old Style

Landfill

Issues concerning water flow through a landfill:

When water (moisture) flows through a landfill, it picks up the toxic substances found in the waste. Water causes the leachate to flow down through the landfill and may contaminate the groundwater.

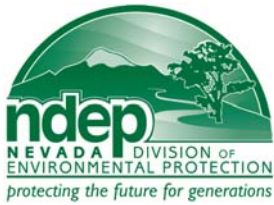
Contaminated groundwater can disrupt the ecosystem by poisoning plants and other wildlife.

By pouring the water into the model landfill, we are demonstrating this concept.

It is important to note that the amount of water in relation to such a the model is extreme. We would not expect to see such a high volume of water to flow through the landfill all at one time. Water does accumulate in the landfills, and over time, this effect may occur.

In Nevada, many of the municipal solid waste landfills are constructed this way.

The waste management companies claim there is a natural protective layer of clay beneath the landfills that prevents leachate from getting into the groundwater.



Support Document

Homework Key

It's the Old Style

Landfill

Homework – KEY

On a computer that has access to the internet, please visit <http://www.epa.gov/recyclecity/mainmap.htm>. Find the landfill within the city. Use the information you gather to answer the following questions.

1. When Recycle City was called Dumptown, the Old Landfill was used. What was put in the landfill?

Answer: Everything. All waste was put in the same “hole” in the ground.

2. What happened when poisonous liquids (caused by the trash) seeped into the soil?

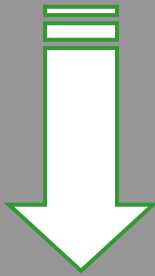
Answer: The groundwater became contaminated.

3. When Dumptown became Recycle City, how did the government fix the groundwater problem?

Answer: They built a “Pump-and-Treat” plant to filter and purify the water.

4. When Recycle City set up its New Landfill, they also set up a Materials Recovery Facility. What does this facility do?

Answer: A Materials Recovery Facility removes the reusable and recyclable materials from the trash. In addition to promoting recycling, it reduces the amount of waste that ends up in the landfill.



5. Besides the reduction of waste, what is the biggest difference between the Old Landfill and the New Landfill?

Answer: The use of a liner system to prevent contaminated water (leachate) from seeping into the earth and groundwater.

6. Please describe each of the five layers in a landfill liner.

Answer:

Layer 1 – the bottom is composed of at least two feet of clay.

Layer 2 – a sheet of strong, flexible, thick plastic is placed over the clay.

Layer 3 – gravel that contains pipes to collect leachate.

Layer 4 – geotextile fabric to protect the pipes.

Layer 5 – soil is placed on top to protect the liner from the waste.

7. Is the model landfill that we made in class more like the Recycle City Old Landfill or like the New Landfill?

Answer: Old

8. Which landfill is better for the environment? Why?

Answer: The New Landfill is better for the environment. The structure calls for a liner system that keeps the hazardous materials from touching the earth. The liner also keeps the leachate from entering the groundwater that may be used for human consumption. The landfill contains less waste because reusable and recyclable materials have been removed.

Objectives: I will understand the “path” waste takes from consumer to landfill.
I will be able to apply mathematical calculations to determine the amount of waste we produce.
I will understand the basic structure of a landfill.
I will construct a model landfill.

Vocabulary:

Municipal Solid Waste:

Landfill:

Transfer Station:

Per Capita:

Leachate:

Vector:

Groundwater:

Solid Waste and Recycling Curriculum

Name: _____

Lesson 2

It's the Old Style

Date: _____

The Calculations:

How much trash is produced in Nevada per capita each day? _____

How many students are in this class? _____

How many people are in Reno? _____

How many people are in Sparks? _____

Please calculate the waste produced by the students in this class each day.

Please calculate the waste produced by the people in Reno each day.

Please calculate the waste produced by the people in Sparks each day.

Please calculate the waste produced by the people in Reno-Sparks each day.

Please calculate the waste produced by the people in Reno-Sparks each week.

Please calculate the waste produced by the people in Reno-Sparks each month

Please calculate the waste produced by the people in Reno-Sparks each year.

Do you think there are adverse effects of landfills?

Please draw the layers of the Old Style Landfill.

Homework

On a computer that has access to the internet, please visit <http://www.epa.gov/recyclecity/mainmap.htm>. *Find the landfill within the city. Use the information you gather to answer the following questions.*

1. When Recycle City was called Dumptown, the Old Landfill was used. What was put in the landfill?

2. What happened when poisonous liquids (caused by the trash) seeped into the soil?

3. When Dumptown became Recycle City, how did the government fix the groundwater problem?

Solid Waste and Recycling Curriculum

Name: _____

Lesson 2

It's the Old Style

Date: _____

4. When Recycle City set up the New Landfill, they also set up a Materials Recovery Facility. What does this facility do?

5. Besides the reduction of waste, what is the biggest difference between the Old Landfill and the New Landfill?

6. Please describe each of the five layers in a landfill liner.

7. Is the model landfill that we made in class more like the Recycle City Old Landfill or like the New Landfill?

Solid Waste and Recycling Curriculum

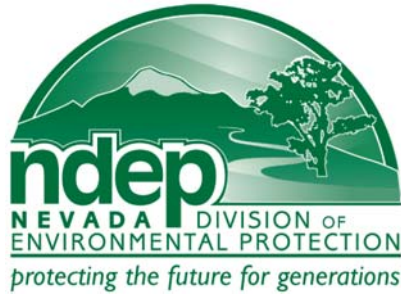
Lesson 2

It's the Old Style

Name: _____

Date: _____

8. Which landfill is better for the environment? Why?



Lesson 3

My Landfill is Sanitary

Landfill

Support Document	Getting the materials ready	M1-47
Support Document	Teaching Strategies	M1-55
Lesson 3, part 1	Lecture / Review	M1-57
Lesson 3, part 2	Lecture / Lab	M1-60
Support Document	Vocabulary	M1-64
Support Document	Layers of a Landfill	M1-65
Support Document	Daily Cover	M1-66
Support Document	Water Flow Issues	M1-67
Support Document	Anatomy Comparison	M1-68
Support Document	Student Worksheets	M1-69

**Support
Document**

My Landfill is Sanitary

Landfill

Support Document

Preparing materials for making the landfill.

Materials Needed

14	2L plastic soda bottles Remove the labels.
1	Scissors or X-Acto knife
1	Pair nylon hose
1	Marker
14	Cotton balls
7	Cups shredded paper
7	Cups small aquarium gravel
7	5in X .5in diameter circle of modeling clay
7	5in diameter circle of plastic trash bag
7	5in diameter circle of geotextile fabric
7	Plastic straws
14	Cups soil
7	Rubber bands
7	Cups water
1	Measuring cup
7	Reusable grocery bags
70	One gallon Zip-Lock bags
1	Roll paper towels

For a class size of 30, prepare kits for 7 landfill columns.

The class will be divided into 6 groups of 5.

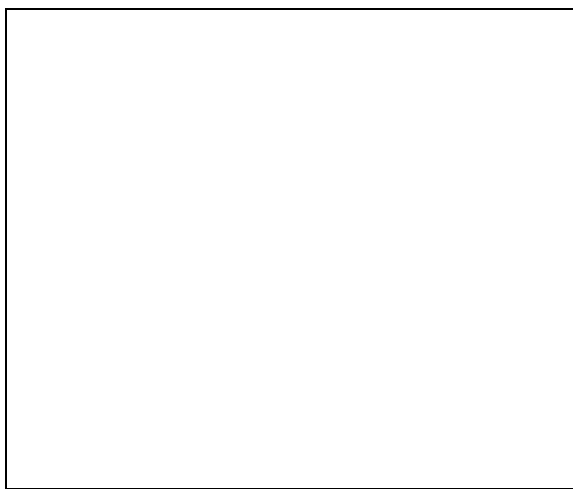
The 7th landfill will be made by the teacher (as a demonstration).

Preparing the plastic soda bottles for the landfill model

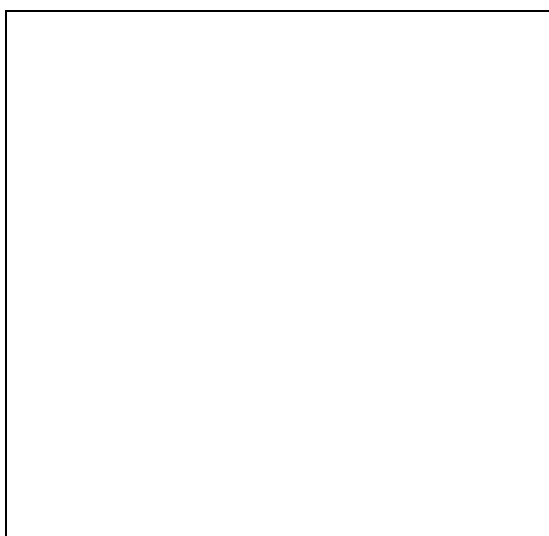
Pre-class Prep:

Bottle #1 Prep

1. Mark just below the taper where the bottom cut will be made.

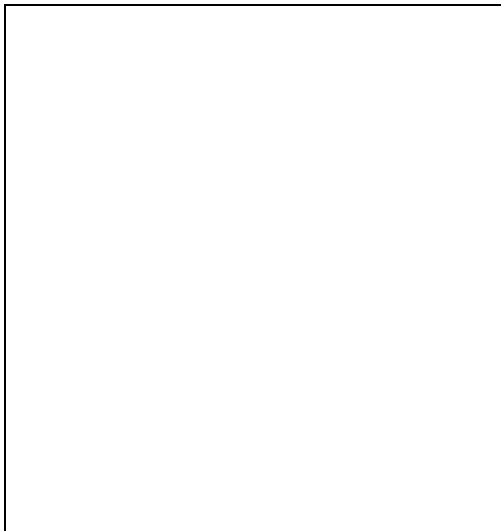


2. Use the scissors or X-Acto knife to cut the bottom off of the first bottle.
3. Write #1 on the finished product.

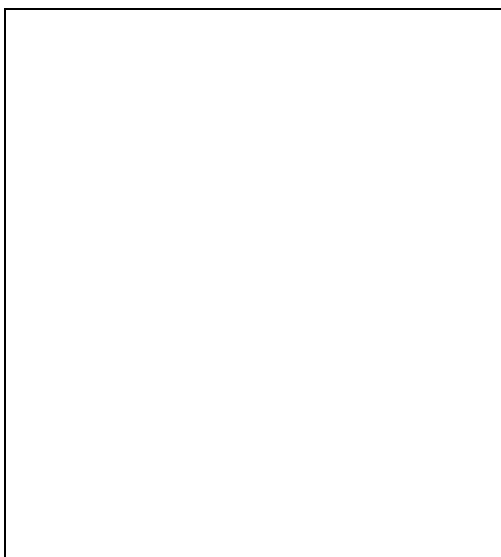


Bottle #2 Prep

4. Mark slightly above the midpoint where the bottom cut will be made.



5. With the scissors or X-Acto knife, cut the bottom off.
6. Write #2 on the finished product.

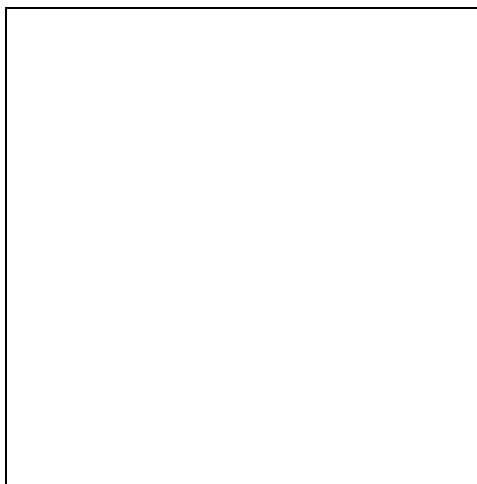


**Support
Document**

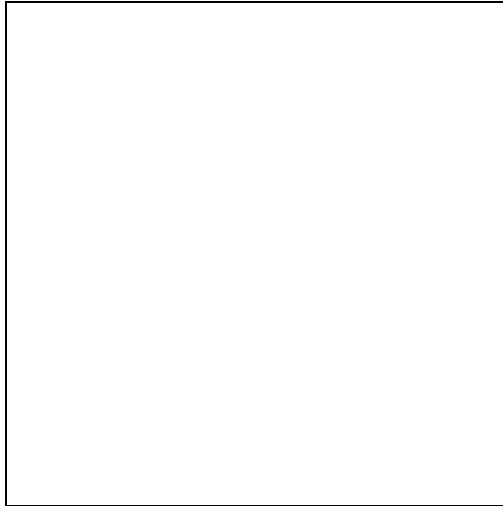
7. Cut the nylon hose into 2" squares.



8. Place 2 cotton balls into the neck of bottle #2.
9. Using the rubber bands, attach the nylon squares to the neck of bottle #2.



10. Assemble the two plastic bottles into the shape of a column.

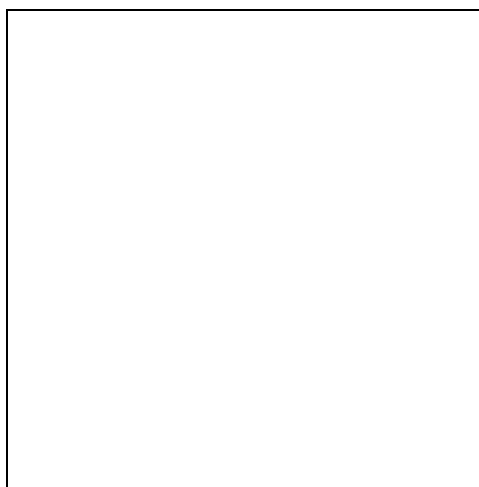


Prepare the contents of the landfill column

11. Measure 1 cup of shredded paper into each of 7 Zip-Lock bags.
12. Measure 1 cup of aquarium gravel into each of 7 Zip-Lock bags.
13. Place 1 plastic straw into each of 7 Zip-Lock bags.
14. Measure 1 cup of water into each of 7 Zip-Lock bags.
15. Measure 1 cup of soil into each of 14 Zip-Lock bags.

**Support
Document**

16. Slice a piece of modeling clay from the large block of clay.
17. Mold the clay into a disk with a diameter approximately equal to the diameter of the 2L plastic soda bottle, approximately $\frac{1}{2}$ in. thick.
18. Fully moisten a paper towel.
19. Wrap the clay disk with the moist paper towel.
20. Place the clay disk into a zip-lock bag.

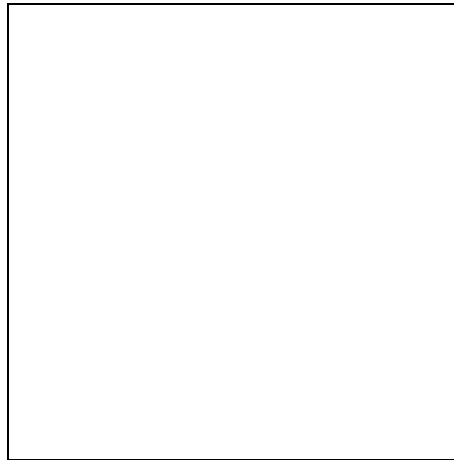


21. Place a piece of discarded 2L soda bottle on the geotextile fabric.
22. Using a marker, trace the outline of the diameter of the soda bottle onto the geotextile fabric.

23. Cut the geotextile fabric into circles.
24. Place the geotextile fabric circle into a zip-lock bag.

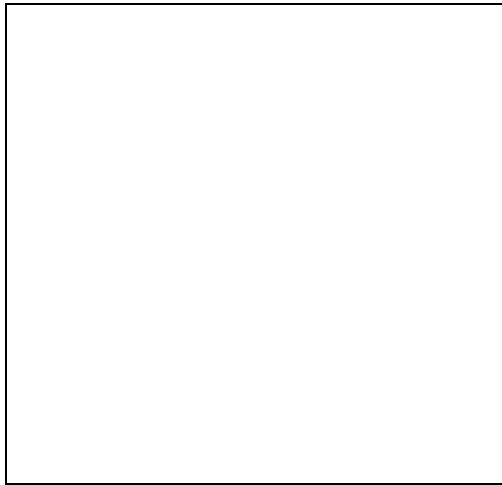
Note: The purpose of geotextile fabric is to allow moisture to pass through, while filtering out dirt or soil. Any type of fabric meeting these criteria will work for this model.

Recommendation: sun shade fabric used for patio shade structures..



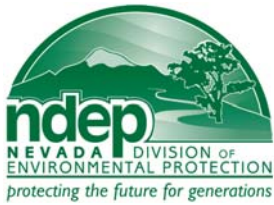
**Support
Document**

25. Place a piece of discarded 2L soda bottle on a plastic trash bag.
26. Using a marker, trace the outline of the diameter of the soda bottle onto the plastic trash bag.
27. Cut the plastic trash bag into circles.
28. Place the plastic trash bag circle into a zip-lock bag.



14. Prepare the landfill model kits in reusable grocery bags by placing the following items in each one:

- 1 Landfill column
- 1 Bag of shredded paper
- 1 Bag of water
- 2 Bags of soil
- 1 Bag of aquarium gravel
- 1 Bag containing plastic circle
- 1 Bag containing modeling clay disk
- 1 Bag containing geotextile circle
- 1 Bag containing plastic drinking straw
- 1 Bag containing plastic circle



Teaching Strategies

My Landfill is Sanitary

Landfill

Teaching Strategies

Lecture

This strategy is effective for all levels of learners.

During the lecture, an alternative may be to use the overhead (use student worksheet as a transparency)

Worksheets

Worksheets are provided to guide the students through the lesson. The lead teacher may prefer the students to take their own notes.

For below level learners and special ed, the teacher may consider having the worksheets filled out for these students. This would be done before class by the teacher or by having an advanced student help.

Group Makeup

Groups should be selected by the lead classroom teacher. The groups should be heterogeneous and learners of all levels should be included.

Group Discovery

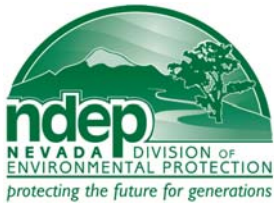
The group work is effective for all levels of learners

Homework questions

Most elementary classrooms have a computer class scheduled as a "special". If you provide the Recycle City link to the computer teacher, class time may be allotted for internet use.

Handouts of printed copies of the Recycle City information contain the same information as the website. If internet use is not available, please use the printouts.

Tip: The student worksheet can be made as a transparency for group discussion.



Lesson Time:
15 minutes

My Landfill is Sanitary Homework Review

Geotextile Fabric

This specially designed fabric allows moisture to pass through while filtering out soil. It allows leachate that may filter through the soil layer to reach the gravel layer. Piping within the gravel layer then pumps and removes the leachate for treatment.

Objective

Students will understand how the homework relates to landfill structure.

Materials Needed

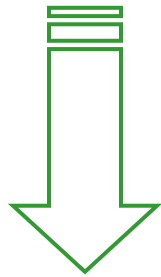
30	Single subject notebooks
6	Dry erase markers
1	White board
1	Homework key

Anticipatory Set

Write the lesson objectives on the white board.
Discuss with the students what the objectives of the lessons are.

Objective: You will make a connection between class discussion and homework.

Distribute handouts (or workbooks).



Introduction:

“Please take out your homework so we can begin discussing it.”

Modeling / Guided Practice


1. Have the students take out their student workbook (or handout).
2. Read the homework questions.
3. Have the students answer the questions.
4. Discuss the answers to the homework.
5. Ask the students to relate how the homework relates to the last lesson.

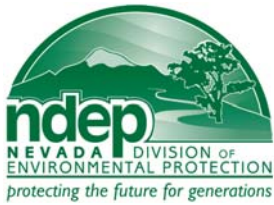


Closure:

1. Ask if the students are making the connection between the landfill that was made last time and the new style they saw at Recycle City.

Independent Practice

1. Not applicable. Transition into part 2 of the lesson.
- 



Solid Waste & Recycling Curriculum

Lesson 3 Part 2

Lesson Time:
30 minutes

Vocabulary

Landfill liner

**Geotextile
fabric**

**Sanitary
landfill**

My Landfill is Sanitary

Landfill

Apex Regional Landfill

Apex Regional Landfill is Nevada's largest landfill. It is located just north of the city of Las Vegas in Clark County.

Objective

Students will understand the basic structure of a sanitary landfill.

Students will understand the difference between the old style landfill and the sanitary landfill.

Materials Needed

30	Single subject notebooks (student's)
6	Dry erase markers
1	White board
7	Prepackaged reusable grocery bags containing landfill model kits.

Anticipatory Set

Write the lesson objectives on the white board.

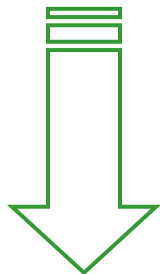
Discuss with the students what the objectives of the lessons are.

Objective: You will understand the basic structure of a landfill.

Objective: You will construct a model landfill.

Introduction:

“So, we discussed last time the structure of the old-style landfill. From the homework you were introduced to the sanitary landfill. Let us now build a model of the sanitary landfill.”



Modeling / Guided Practice

1. On the white board, draw the layers of the landfill (see support materials)
2. Have the students copy a drawing of the model in their notebook.
3. Have the students assemble into their preselected groups of 5.
4. Pass out the landfill kits in prefilled reusable grocery bags.

Assemble the model landfill

5. Assemble the bottom of bottle #1 with the top of bottle #2 to form the structure of the landfill. This is to show the students how the model will fit together. Take care not to shove them together too tightly.
6. Add 1 cup of soil to the model to represent the ground.
7. Have the students do the same.
8. Add the modeling clay disk to the model. When doing this, be sure to press the clay to the sides of the bottle to form a seal. (This will be important later.)
9. Have the students do the same.
8. Add the precut plastic circle to form the liner.
9. Have the students do the same.
10. Add the aquarium gravel.
11. Have the students do the same.
12. Add the plastic drinking straw to the model. Explain that pipes are included in this layer for collection and treatment of leachate.
13. Have the students do the same.
14. Add the precut circle of the material representing the geotextile fabric.
15. Have the students do the same.
16. Add a layer of soil to the model.
17. Have the students do the same.
18. Compare the anatomies of the two types of landfills up to this point.

Modeling / Guided Practice

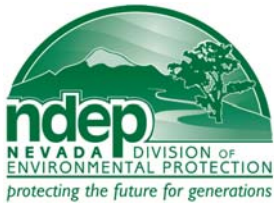
19. Add shredded paper to the model to represent the MSW.
20. Have the students do the same.
21. Add a final layer of soil to the model to represent the daily cover.
22. Have the students do the same.
23. Discuss the reasons for daily cover.
24. Using the measuring cup, pour water into the landfill model.
25. Have the students do the same.
26. Ask the students if the water is flowing through their landfills.
27. Connect leachate with the flow of water through the landfill.

Closure:

1. Ask if the students understand how the landfill was made.
2. Ask if they understood the purpose of the lesson.

Independent Practice

1. Not applicable for this lesson.



Support Document

VOCABULARY

My Landfill is Sanitary

Landfill

Vocabulary

Landfill Liner: A system of physical barriers in a landfill designed to prevent toxic leachate from reaching the groundwater.

Geotextile Fabric: A fabric used within a liner system to prevent large particles of soil and municipal solid waste from entering the leachate recovery system. The

Sanitary Landfill: A landfill that has a liner system.

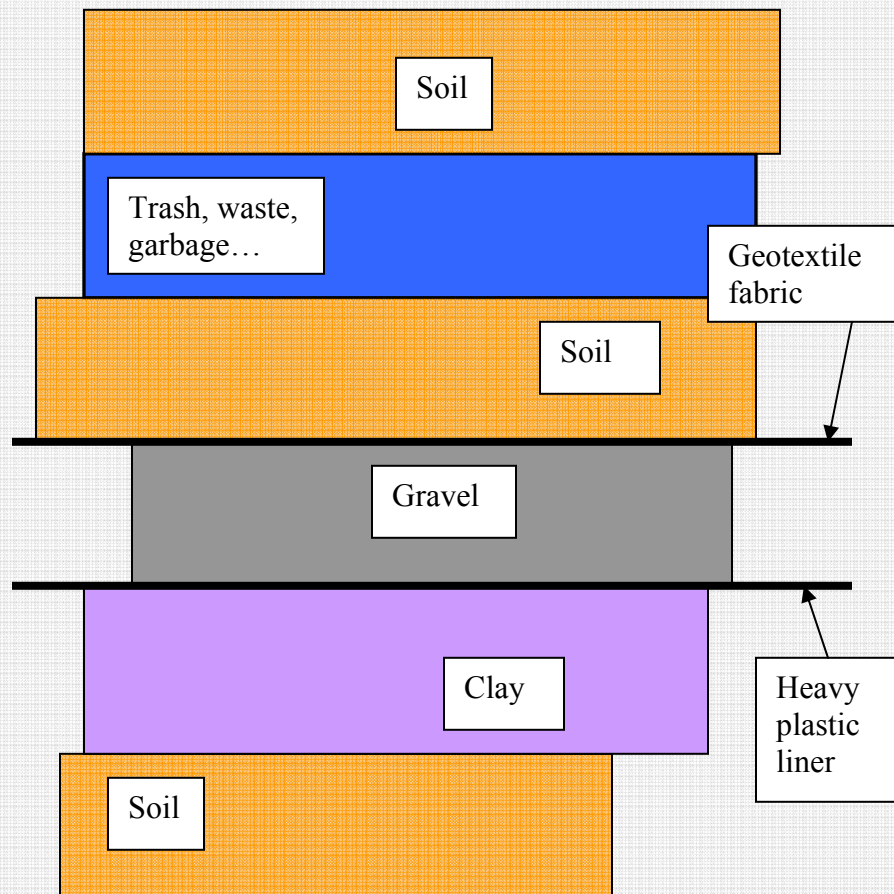
**Support
Document**

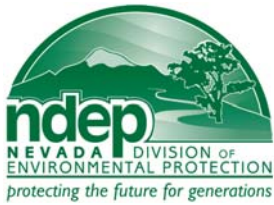
My Landfill is Sanitary

Landfill

Support Document

Layers of Sanitary Landfills





Support Document

My Landfill is Sanitary

Landfill

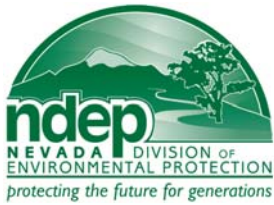
Reasons for daily cover:

Odor control

Fire Control

Vector control

Daily cover consists of 6 inches of dirt.



Support Document

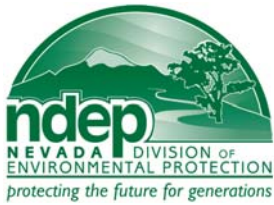
My Landfill is Sanitary

Landfill

Issues concerning water flow through a sanitary landfill:

By pouring the water into this landfill model, we are showing the concept of leachate recovery.

****In a Sanitary Landfill, the liner structure is designed to trap leachate and prevent it from seeping into the groundwater. In the model, the clay disk should prevent the water from flowing through the landfill.**



Support Document

My Landfill is Sanitary

Landfill

Comparing the anatomies of the two landfill styles:

Please refer to the diagrams in lesson 2 and 3 for visual representations.

Old Style landfill:

EARTH, TRASH, EARTH, TRASH, EARTH, etc.

Sanitary landfill:

EARTH, CLAY, PLASTIC LINER, GRAVEL, GEOTEXTILE FABRIC, EARTH, TRASH, EARTH, etc.

Please refer to the homework key for the benefits of sanitary landfills:

8. Which landfill is better for the environment? Why?

Answer: The New Landfill is better for the environment. The structure calls for plastic liners that keep the hazardous materials from seeping into the groundwater. The liners also keep the leachate from entering the groundwater that may be used for human consumption. The sanitary landfill also contains less waste because reusable and recyclable materials have been removed.

Objectives: I will understand the basic structure of a sanitary landfill.
I will understand the structural difference between the old style and the sanitary landfill.

Vocabulary:

Landfill Liner:

Geotextile Fabric:

Sanitary Landfill:

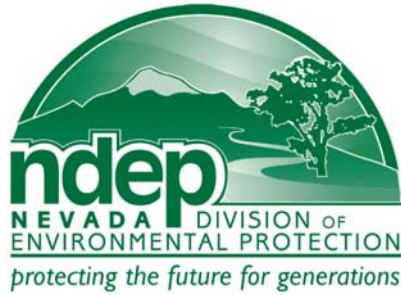
Please draw the structure of a sanitary landfill:

Sanitary Landfill:

What are the benefits of using a sanitary landfill?

What are your general thoughts on the differences between the sanitary landfill and the old style landfill?

Why is it important to prevent leachate from getting into the groundwater?



Lesson 4

How Long Does Trash Last?

Waste Decomposition

Support Document	Teaching Strategies	M1-73
Lesson 4	Lecture / Activity	M1-75
Support Document	Vocabulary	M1-79
Support Document	Fact Sheet	M1-80
Support Document	Slow Decomposition	M1-82
Support Document	Rathje—Garbage Project	M1-83
Support Document	Student Worksheets	M1-85

Teaching Strategies

How Long Does Trash Last?

Waste Decomposition

Teaching Strategies

Group Makeup

Groups should be selected by the lead classroom teacher. The groups should be heterogeneous and learners of all levels should be included.

Group Discovery

The group work is effective for all levels of learners

Chart work

For below level learners and special ed, the teacher may consider having the chart filled out for these students. This would be done after class by the teacher or by having an advanced student help.

Discussion questions

For below level learners and special ed, the teacher may consider grouping the students together. Read the questions aloud and discuss. Help them put their thoughts on paper.

If there are students without home support, you may want to consider letting the students give you the answers orally or help during lunch/recess/before or after school.

Tip: The student worksheet can be made as a transparency for group discussion.

Lesson Time:
60 minutes

Vocabulary

Decompose

Recycle

Reuse

Reduce

Biodegrade

How Long Does Trash Last?

Waste Decomposition



Glass bottles will never decompose.
Glass bottles will never biodegrade.

All decomposition times listed in the exercise below are speculation based on decomposition rates and chemical properties. These times are estimates under “normal conditions.” Refer to William Rathje’s Garbage Project for examples of how long items will last under landfill conditions.

Oh...two facts that *everyone* agrees on...

Glass bottles will never decompose.

Glass bottles will never biodegrade.

Objective

Students will discover how long experts think it takes MSW to break down.
Students will create a chart for MSW decomposition times.
Students will review factors involved in MSW breakdown inside a landfill.

Materials Needed

30	Workbooks (or handouts)
6	Dry erase markers
1	White board

Anticipatory Set

Revisit the concepts from the last two lessons.

Write the lesson objectives on the white board (or show on overhead).
Discuss with the students what the objectives of the lessons are.

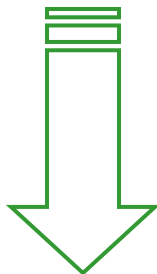
Objective: You will discover how long experts think it takes MSW to break down.

Objective: You will create a chart for MSW decomposition times.

Objective: You will review the factors involved in MSW breakdown inside a landfill.

Introduction:

“So last week we explored the concept of landfills and how they work. I have a list of some things that might end up in the trash. So, unless materials get recycled or reused, they end up in a landfill. Do you ever think about how long the items stay in the landfill before they break down or decompose? We are going to explore how long it will take the items here to decompose or break down.”



Modeling / Guided Practice

1. Have the students take out their workbooks (or handouts).
2. Discuss the key vocabulary words for the lesson. Have the students write the definitions on their worksheets.
3. Divide the students into groups of 5.
4. Draw the students' attention to the list of items on their worksheet.
5. Have the students write which group they belong to in their notebook.
6. As a group, the students should list the amount of time they think the items will take to decompose on the worksheet.
7. When all groups are done, have one rep from each group share their list.
8. Create a table, using the data from all of the groups, on the board. Have the students copy the information into the large table on their worksheets.
9. On the board, write down the degradation times given by scientists.
10. Have the students copy the scientists' list of degradation times onto their worksheet.
11. If there are differences, have discussion as to why.
12. Inform the students that the reason it takes so long for items to decompose in a landfill (see support document)
13. Discuss Rathje's Garbage Project. (see support documents)

All decomposition times listed in the exercise are speculation based on decomposition rates and chemical properties.
The times are estimates under “normal conditions.”
Refer to William Rathje’s Garbage Project for examples of how long items will last under landfill conditions.

Closure:

1. Close by going over the times it takes for each material to degrade.
2. Emphasize the amount of time recyclables take to degrade.
3. Reinforce the importance of recycling and reusing.

Independent Practice

1. Have the students answer the two questions in their workbook. (This can be done in class if time allows; otherwise, it should be done for homework.)



Support Document

VOCABULARY

How Long Does Trash Last?

Waste Decomposition

Vocabulary

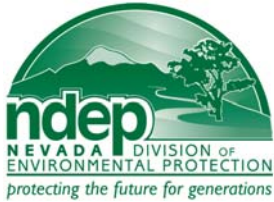
Decompose: To break down into its smallest elements.

Recycle: To break down an item for reuse in producing the same or another kind of item. Example: plastic bottle into a fleece jacket or back into a plastic bottle.

Reuse: Using an item again and again so it will not end up in a landfill. Example: jelly jars used as glasses.

Reduce: To produce less waste by being careful of the way we consume items. The best way to reduce is to buy items with less packaging. Example: purchasing shampoo in bulk or bringing your own container.

Biodegrade: To break down into its smallest elements through the use of micro-organisms.



Support Document

How Long Does Trash Last?

Waste Decomposition

Support Document

Materials

Original List

Aluminum can
Banana
Cigarette butt
Cotton rag
Glass bottle
Leather boot (or shoe)
Paper bag
Plastic 6-pack rings
Plastic jug
Rubber sole of leather boot (or shoe)
Styrofoam cup
Tin can
Wool sock

Materials and Degradation Time

<u>Scientist List (proper order)</u>	<u>Degradation time</u>
Banana	3-4 weeks
Paper bag	1 month
Cotton rag	5 months
Wool sock	1 year
Cigarette butt	2-5 years
Leather boot (or shoe)	40-50 years
Rubber sole of leather boot (or shoe)	50-80 years
Tin can	80-100 years
Aluminum can	200-500 years
Plastic 6-pack rings	450 years
Plastic jug	1 million years
Styrofoam cup	Unknown? Forever?
Glass bottle	Unknown? Forever?

Support Document

How Long Does Trash Last?

Waste Decomposition

Reasons why items decompose slowly (or not at all!) in a landfill:

Landfills are designed to prevent decomposition. In order for most items to decompose, they need air and water.

Every day 6 inches of soil is placed on the landfill. These layers of trash are then starved of air.

In order to prevent the production and movement of leachate, water is discouraged from entering the landfill.

Because of these conditions (“dry tomb”), items in a landfill decompose at a much slower rate than they would in other conditions.

Support Document

How Long Does Trash Last?

Garbage Project

William Rathje is an archaeologist with the University of Arizona. He began a project in 1972 called The Garbage Project. This project began as a look at the nature of modern human society.

He is the author of RUBBISH!: The Archaeology of Garbage.

The following quotes are listed to provide examples of how long our trash stays in landfills.

(It is important to note that the landfills used in the examples are in the state of Arizona...a climate very similar to Nevada.)

There is no specific date listed for the excavation described.

“Instead of garbage that was at most a few days old, researchers began dealing with garbage that was ten, twenty, thirty years old—sometimes even older.”

Rathje describing the headlines of some of the *newspapers* found from 1971, 1967, and 1952.

Page 113

In one landfill, Rathje describes organic material from a landfill layer from the 1950's:

“Almost all the organic material remained readily identifiable: Pages from coloring books that were still clearly that, onion parings were onion parings, carrot tops were carrot tops. Grass clippings that might have been thrown away the day before yesterday spilled from bulky black lawn and leaf bags, still tied with twisted wire...Whole hot dogs have been found in the course of every excavation...”

Page 114

Lesson 4**How Long Does Trash Last?**

Date: _____

Objectives: You will discover how long experts think it takes MSW to break down.
 You will create a chart for MSW decomposition times.
 You will review factors involved in MSW breakdown inside a landfill.

Vocabulary:

Decompose:

Reduce:

Reuse:

Recycle:

Biodegrade:

Decomposition List:

Group # _____

List of items	Decomposition time
Aluminum can	
Banana	
Cigarette butt	
Cotton rag	
Glass bottle	
Leather boot	
Paper bag	
Plastic 6-pack rings	
Plastic jug	
Rubber sole of leather boot	
Styrofoam cup	
Tin (steel) can	
Wool sock	

Solid Waste and Recycling Curriculum
Lesson 4

Name: _____

How Long Does Trash Last?

Date: _____

List of items	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Scientist's list
Aluminum can								
Banana								
Cigarette butt								
Cotton rag								
Glass bottle								
Leather boot								
Paper bag								
Plastic 6-pack rings								
Plastic Jug								
Rubber sole of leather boot								
Styrofoam cup								
Tin (steel) can								
Wool sock								

Lesson 4

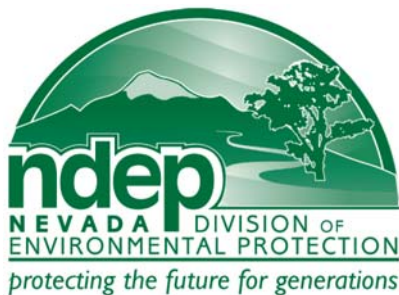
Name: _____

How Long Does Trash Last?

Date: _____

Why does it take so long for items to decompose in a landfill?

Based on the information above, why does it make sense to reduce, reuse, and recycle?

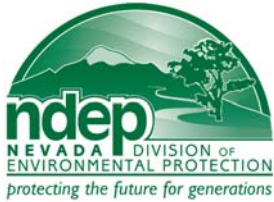


Lesson 5

Potato Chip Dilemma

Reduce

Support Document	Teaching Strategies	M1-91
Lesson 5	Lecture / Activity	M1-93
Support Document	Vocabulary	M1-97
Support Document	Discussion Questions	M1-98
Support Document	Student Worksheets	M1-101



Teaching Strategies

Potato Chip Dilemma

Reduce

Teaching Strategies

Group Discovery

The group work is effective for all levels of learners.

Whole Group Discussion

Many lead teachers have popsicle sticks with students names on them for “random” selection of students. Use the name sticks to draw names to answer whole group discussion questions.

Small Group Discussion / Shoulder Partners

The small group work is effective for all levels of learners. The discussion of individual answers will allow all students to participate. It will also allow individual students to hear another classmate’s ideas in a more relaxed setting (they will not be afraid of sharing information).

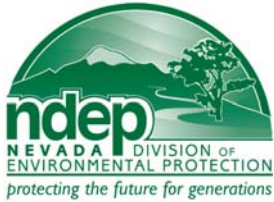
Discussion questions

For below level learners and special ed, the teacher may consider grouping the students together. Read the questions aloud and discuss. Help them put their thoughts on paper.

If there are students without home support, you may want to consider letting the students give you the answers orally or help during lunch/recess/before or after school.

Tip: The student worksheet can be made as a transparency for group discussion.

WARNING—Please check for food allergies before performing this lesson. Adjust the type of chips and or make special arrangements for students that need accommodations.



Lesson Time:
60 minutes

Vocabulary

Packaging

Secondary
Packaging

The Potato Chip Dilemma

Reduce

**What can you and your family do
to reduce the waste you produce?**

Objective

Students will understand the importance of reducing waste.
Students will recognize how they can reduce waste.

Materials Needed

30	Workbooks (or handouts)
6	Dry erase markers
1	White board
2	Large measuring bowls
1	Large bag potato chips (20oz)
20	Small bags potato chips (equal weight to the large bag)
1	Roll paper towels
10	Sandwich sized zip-lock baggies
10	Plastic reusable food containers

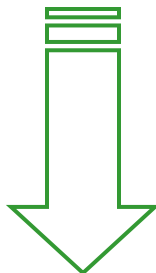
Anticipatory Set

Review the questions assigned for independent practice (from the last lesson) if applicable.

Write the lesson objectives on the white board (or show on overhead).
Discuss with the students what the objectives of the lessons are.

Objective: You will understand the importance of reducing waste.

Objective: You will recognize how you can reduce waste.



Introduction:

“Today I want to talk about waste reduction. If we use fewer materials then less waste will end up in a landfill...”

Modeling / Guided Practice

1. Have the students take out their workbooks (or handouts).
2. Discuss the key vocabulary words for the lesson. Have the students write the definitions on their worksheets.
3. Arrange a table near the front of the class with the measuring bowls and the packages of potato chips on it.
4. Begin by discussing how the potato chips on the table are packaged.
(One large bag vs. 20 small bags and their outside packaging)
5. Have one of the students open and pour out the potato chips from the large bag into one of the measuring bowls.
6. Make a quick measurement (approximate visual) of the volume of chips.
7. Have 20 other students open the small bags and pour contents into the other measuring bowl. Throw the trash in a pile on the floor.
8. Make a quick visual measurement of the volume of chips (approximate).
(The volumes of chips in the 2 bowls should be approximately the same.)
9. Discuss the difference in the amount of packaging used to contain the same volume of chips.
(Stress the visual waste around the table)
10. Pass out the chips to the students...(to destroy the evidence)
Give some of the chips out on paper towels
Give some of the chips out in plastic baggies
Give some of the chips out in reusable containers
11. Discuss the implications of “secondary packaging” and waste reduction.
Can the plastic baggies be reused or recycled?
Can the paper towels be reused or recycled?
Can the reusable containers be reused or recycled?
12. Are there limitations to the reuse of the secondary packaging?
13. How does this affect waste reduction?
14. Allow class time to work on the notebook worksheets.

Modeling / Guided Practice

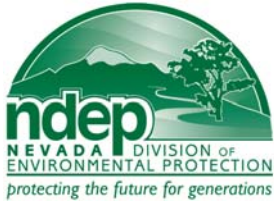
15. Scaffold for support.
16. When the students are done have them share their answers with a shoulder partner.

Closure:

1. Close by summarizing the activity.
2. Emphasize some of the responses that the students gave.
3. Reinforce the importance of reducing waste.

Independent Practice

1. Not applicable for this lesson.



Support Document

VOCABULARY

Potato Chip Dilemma

Reduce

Vocabulary

Packaging: how the items we consume or purchase are put together for sale or use.

Secondary Packaging: the containers that we use for items once they are taken out of the original container.

The concept behind these vocabulary words (and this lesson) is to get students to think about how much waste there is in consumer packaging.

Support Document

Potato Chip Dilemma

Reduce

Discussion Questions:

Can plastic baggies be reused or recycled? (limitations?)

Reuse, with limitations. The bags have a limited lifetime with normal use.

Recycling, no.

Can paper towels be reused or recycled? (limitations?)

Reuse, no. Most people do not reuse paper towels. They are designed for one-time use.

Recycling, no.

Can reusable containers be reused or recycled? (limitations?)

Reuse, yes. Products like Tupperware are a good way to reuse. They can be used over and over again. You can put different products in them if they are washed.

Recycling, no.

Worksheet Questions:

1. The large bag of chips holds the same amount as the total contents of the smaller bags. But which option produces more waste – the single large bag or the combined smaller bags?

We are looking for the amount of waste packaging. In this case, the small bags produce more waste.

2. For waste management, which is preferable? One large bag or many small ones?

Since a large number of small bags produce more waste, for waste management purposes, one large bag is preferable.

3. Knowing that a single large bag takes up less landfill space than many small ones - why might a shopper still select to buy many small bags instead of one large one?

More convenience in lunch box, greater mobility, easier to keep fresh longer, easier to make sure everyone gets the same amount.

4. Come up with a scenario in which one large bag would actually create more waste. (Think outside of the blue box)

Product freshness may be a concern. Chips in the big bag may get stale and unappetizing and get thrown into the trash. Using the smaller bags may actually create less waste.

To bring from the large bag for lunch, a parent may need to buy small disposable baggies in which to put a smaller quantity of chips, thus creating more waste.

NOTE: This could be countered by reuse of the same baggie many times rather than throwing it away.

5. What does it mean when we create less trash? What can you and your family do to reduce the waste that is landfilled?

This is open for discussion. Try to emphasize reduction and reuse. This may also be a good time to introduce recycling.

Your assignment is to come up with a way to bring your lunch to school every day for two weeks. Your lunch should include a sandwich, chips (or pretzels), a drink, a dessert, and a way to clean yourself up (hands and face). Generate as little landfill waste as possible.

Answer: There is no one correct answer. There will be as much variation in responses as you have kids. An example might be: I will use a batman lunchbox. For my sandwich, chips, and cookies, I will use reusable plastic containers (they are rigid, heavy-duty washable containers). For my drink I will use a reusable heavy-duty plastic drink container that is washable. I will also include a cloth napkin that can be laundered.

Visit www.wastefreelunches.com for more info.

Objectives: You will understand the importance of reducing waste.
You will recognize how you can reduce waste.

Vocabulary:

Packaging:

Secondary Packaging:

Please answer the following questions:

1. The large bag of chips holds the same amount as the total contents of the smaller bags. But which option produces more waste – the single large bag or the combined smaller bags?
2. For waste management, which is preferable: One large bag or many small ones?
3. Knowing that a single large bag takes up less landfill space than many small ones - why might a shopper choose to buy many small bags instead of one large one?

4. Come up with a scenario in which one large bag would actually create more waste.
(Think outside of the blue box)

5. What does it mean when we create less trash? What can you and your family do to reduce the waste that must be landfilled.

Why should we reduce the amount of waste we produce?

When you are formulating your answer, please think outside the (blue) box. Remember to apply the concepts of Reduce and Reuse. Be prepared to discuss the assignment during the next class period.

Please write or draw your answer. (You do not actually have to bring your lunch for 2 weeks.)

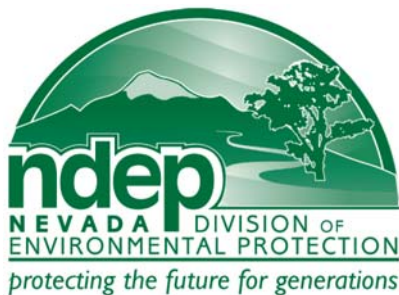
Your assignment is to:

1. Come up with a way to bring your lunch to school every day for two weeks.

Your lunch should include:

- a sandwich**
- chips (or pretzels)**
- a drink**
- a dessert**
- a way to clean yourself up (hands and face)**

2. Generate as little landfill waste as possible.



Lesson 6

Play It Again, Sam

Re-use

Support Document	Teaching Strategies	M1-107
Lesson 6	Lecture / Activity	M1-109
Support Document	Brochure (example)	M1-113
Support Document	Student Worksheets	M1-115

Teaching Strategies

Play It Again, Sam

Re-use

Teaching Strategies

Read-Aloud

The group work is effective for all levels of learners.

Whole Group Discussion

Many lead teachers have popsicle sticks with students names on them for “random” selection of students. Use the name sticks to draw names to answer whole group discussion questions. In this lesson, this strategy is to be used during closing exercises.

Small Group Discussion / Work

For below level learners and special ed, the teacher may consider grouping the students together. Read the instructions / rubric aloud and discuss. Help them put their thoughts on paper.

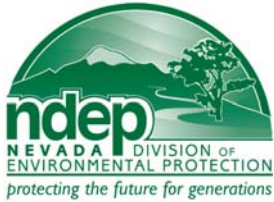
The discussion of individual questions/topics will allow all students to participate. It will also allow individual students to hear another classmate’s ideas in a more relaxed setting (they will not be afraid of sharing information).

Rubrics

The use of a detailed rubric will allow the students to understand exactly what they are being asked to do. In this lesson, there is a rubric for each page they are expected to do.

The rubric will allow the instructor to easily grade the student’s work. For more advanced classes, the instructor may want the students to grade their own work.

Tip: The student worksheet can be made as a transparency for group discussion.



Lesson Time:
60 minutes

Play It Again, Sam

Re-use

How can I reuse a 20 oz. plastic soda bottle?

I cut off the bottom to make a paper clip holder.

There are many things we can re-use rather than throw away. This lesson will bring awareness to the issue of re-use.

Objective

Students will be introduced to the concept of material re-use.
Students will construct a product brochure to show mastery of the re-use concept.

Materials Needed

30	Workbooks (or handouts)
1	<u>The Dumpster Diver</u> by Janet S. Wong
1	White board
1	Set of dry erase markers
30	Pieces printer paper
30	Sets colored pencils / crayons

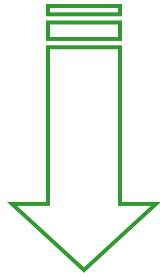
Anticipatory Set

Write the lesson objectives on the white board.
Discuss with the students what the objectives of the lessons are.

Objective: You will be introduced to the concept of material re-use.

Objective: You will construct a product brochure to show mastery of the re-use concept.

Distribute handouts (or workbooks).



Introduction:

“Today we are going to look at the topic of re-use. We will start by reading a picture book called The Dumpster Diver by Janet S. Wong.”

We are going to follow that with an exercise in which you are going to make a brochure for an item you will re-use.

Modeling / Guided Practice

1. Teacher Read-Aloud.
2. When the read-aloud is done have the students focus their attention to the handouts (workbook).
3. Discuss what the final product (brochure) should look like.
(show example listed in support documents)
4. Present and discuss the rubrics that will be used to assess the student’s work.
5. Grade the example to show the students what to look for.
6. Pass out the printer paper and the colored pencils.

Modeling / Guided Practice

7. The students should select one of the 6 items listed in their worksheet for reuse.
8. Once the students have selected an item, have them write what the final (re-use) item will be on their worksheet.
9. Allow the students to work for the rest of the class period to complete the brochures.

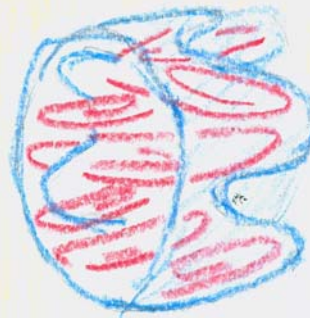

Remind the students to carefully read and follow the rubric.

Closure:

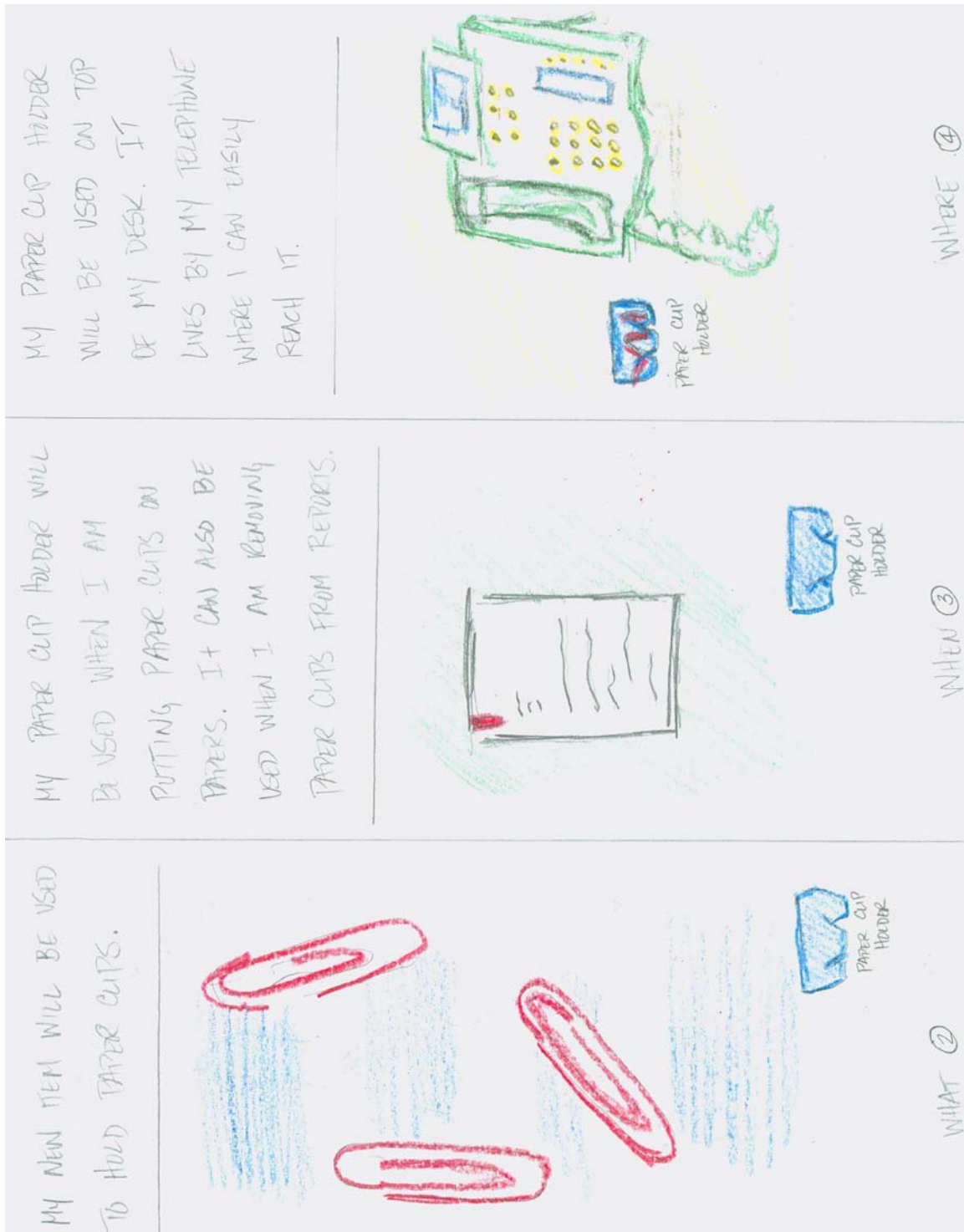
1. Select a few students to share their work. Focus on the positive aspects of the work.

Independent Practice

1. Not applicable for this lesson.

<p>MY PAPER CUP HOLDER HAS A LARGE OPENING ON TOP, THIS LARGE OPENING WILL ALLOW ME TO REACH IN TO GRAB LOOSE PAPER CUPS. IT IS ALSO EASY TO STORE MANY PAPER CUPS IN ONE PLACE AT ONE TIME</p>	 <p>HOW ⑤</p>
<p>MY PAPER CUP HOLDER IS IMPORTANT BECAUSE IT ALLOWS ME TO BE MORE EFFICIENT AND SAVE TIME. IT IS IMPORTANT BECAUSE THE PLASTIC DID NOT GO IN A LANDFILL. IT IS ALSO IMPORTANT BECAUSE IT LOOKS COOL AND MANY PEOPLE ASK ME ABOUT IT. MY PAPER CUP HOLDER IS A GOOD EXAMPLE OF REUSING MATERIALS.</p>	<p>AWAWARENESS</p>  <p>WITH 6</p>
<p>ORIGINAL ITEM: SODA BOTTLE</p> 	<p>NEW ITEM: PAPER CUP HOLDER</p>  <p>MR. KEITH ①</p>

“Back” of brochure page (pages 2, 3, and 4).



Objectives: You will create a brochure for an item you will reuse.
You will understand the importance of reusing materials.

List of items that may be used / reused in your brochure

Please select one of the following:

- Shoe Box
- Flower Pot
- Altoid Tin
- Eyeglass Lens
- Paper Towel Tube
- Newspaper

Write your selection in the space below.

Reuse / transform the item into something that will have a different use.

Write that new “final product” in the space below

Before you begin, take one sheet of printer paper and fold it into 3 equal sections with the left panel flap over / on top.

Write your name on the bottom of page 1. (cover)

Write “What” on the bottom of page 2. (left inside panel)

Write “When” on the bottom of page 3. (center inside panel)

Write “Where” on the bottom of page 4. (right inside panel)

Write “How” on the bottom of page 5. (flap panel)

Write “Why” on the bottom of page 6. (back center panel)

Lesson 6

Play It Again, Sam

Page 1. The original item to be transformed into the final product.

	0	Needs Work 1	Approaching Expectations 2	Meets Expectations 3	Score Received
States item for reuse and final product	No mention of items		States one item	States original item and final product	
Proper use of spelling, grammar, and punctuation.	Contains more than 3 errors	Contains 2-3 errors	Contains 1 error	No errors	
Includes illustrations	No illustrations	Illustration for one item. No color.	Illustration for original item and final product. No color. OR Illustration for one item. Use of color	Illustration for original item and final product. Use of color	

Page 2. What will my final product be used for?

	0	Needs Work 1	Approaching Expectations 2	Meets Expectations 3	Score Received
Describe <u>What</u> the final product is used for	Does not state what the product will be used for	Difficulty stating what the final product will be used for. Does not restate question in description.	Clearly states what the final product will be used for. Does not restate question in description. OR Difficulty stating what the final product will be used for. Restates question in description.	Clearly states what the final product will be used for. <u>Restates question in description.</u>	
Proper use of spelling, grammar, and punctuation.	Contains more than 3 errors	Contains 2-3 errors	Contains 1 error	No errors	
Includes illustrations	No illustrations.	Illustration that does not relate.	Illustration showing what the final product is used for. No use of color.	Illustration <u>showing what the final product is used for.</u> Use of color.	

Lesson 6**Play It Again, Sam**

Date: _____

Page 3. When will my final product be used?

	0	Needs Work 1	Approaching Expectations 2	Meets Expectations 3	Score Received
Describe <u>When</u> the final product can be used	Does not state when the product will be used.	Difficulty stating when the final product will be used. Does not restate question in description.	Clearly states when the final product will be used. Does not restate question in description. OR Difficulty stating when the final product will be used. Restates question in description.	Clearly states when the final product will be used. <u>Restates question in description.</u>	
Proper use of spelling, grammar, and punctuation.	Contains more than 3 errors	Contains 2-3 errors	Contains 1 error	No errors	
Includes illustrations	No illustrations.	Illustration that does not relate.	Illustration showing when the final product is used. No use of color.	Illustration <u>showing when the final product is used.</u> Use of color.	

Page 4 Where will my final product be used?

	0	Needs Work 1	Approaching Expectations 2	Meets Expectations 3	Score Received
Describe <u>Where</u> the final product can be used	Does not state where the product will be used.	Difficulty stating where the final product will be used. Does not restate question in description.	Clearly states where the final product will be used. Does not restate question in description. OR Difficulty stating where the final product will be used. Restates question in description.	Clearly states where the final product will be used. Restates question in description.	
Proper use of spelling, grammar, and punctuation.	Contains more than 3 errors	Contains 2-3 errors	Contains 1 error	No errors	
Includes illustrations	No illustrations.	Illustration that does not relate.	Illustration showing where the final product is used. No use of color.	Illustration <u>showing where the final product is used.</u> Use of color.	

Lesson 6

Play It Again, Sam

Date: _____

Page 5 How will my final product be used?

	0	Needs Work 1	Approaching Expectations 2	Meets Expectations 3	Score Received
Describe <u>How</u> the final product can be used	Does not state how the product will be used.	Difficulty stating how the final product will be used. Does not restate question in description.	Clearly states how the final product will be used. Does not restate question in description. OR Difficulty stating how the final product will be used. Restates question in description.	Clearly states how the final product will be used. <u>Restates question in description.</u>	
Proper use of spelling, grammar, and punctuation.	Contains more than 3 errors	Contains 2-3 errors	Contains 1 error	No errors	
Includes illustrations	No illustrations.	Illustration that does not relate.	Illustration showing how the final product is used. No use of color.	Illustration <u>showing how the final product is used.</u> Use of color.	

Page 6 Why my final product is useful?

	0	Needs Work 1	Approaching Expectations 2	Meets Expectations 3 3	Score Received
Describe <u>Why</u> the final product is important	Does not state why the product is important.	Difficulty stating why the final product is important. Does not restate question in description.	Clearly states why the final product is important. Does not restate question in description. OR Difficulty stating why the final product is important. Restates question in description.	Clearly states why the final product is important. <u>Restates question in description.</u>	
Proper use of spelling, grammar, and punctuation.	Contains more than 3 errors	Contains 2-3 errors	Contains 1 error	No errors	
Includes illustrations	No illustrations.	Illustration that does not relate.	Illustration showing why the final product is useful. No use of color.	Illustration <u>showing why the final product is useful.</u> Use of color.	

Re-Use Brochure Rubric Score Sheet

Page 1	Points earned:
Page 2	Points earned:
Page 3	Points earned:
Page 4	Points earned:
Page 5	Points earned:
Page 6	Points earned:

Total points earned:	Total possible: 54	Percent:
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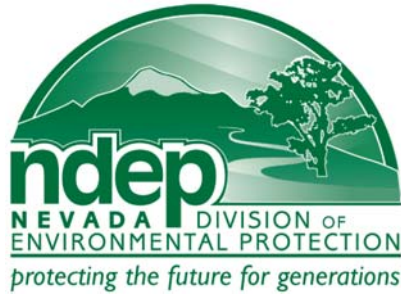
Solid Waste and Recycling Curriculum

Lesson 6

Name:_____

Play It Again, Sam

Date:_____



Lesson 7

Warhol Waste

Art Project / Assessment

Support Document	Teaching Strategies	M1-123
Lesson 7	Lecture / Activity	M1-125
Support Document	Student Worksheets	M1-129

Teaching Strategies

Warhol Waste

Art Project / Assessment

Teaching Strategies

Small Group Discussion / Work

For below level learners and special ed, the teacher may consider grouping the students together. Read the instructions / rubric aloud and discuss. Help them put their thoughts on paper.

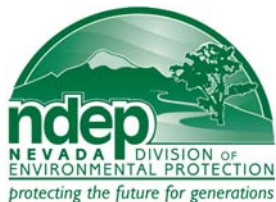
The discussion of individual questions/topics will allow all students to participate. It will also allow individual students to hear another classmate's ideas in a more relaxed setting (they will not be afraid of sharing information).

Rubric

The use of a detailed rubric will allow the students to understand exactly what they are being asked to do. In this lesson, there is a rubric for each topic they are expected to cover.

The rubric will allow the instructor to easily grade the student's work. For more advanced classes, the instructor may want the students to grade their own work.

Tip: The student worksheet can be made as a transparency for group discussion.



Lesson Time:
60 minutes

Warhol Waste

Art Project / Assessment

Make Andy proud.

Objective

Students will construct a collage to show mastery of the concepts presented from previous lessons.

Materials Needed

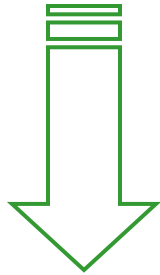
30	Workbooks (or handouts)
30	Magazines
1	White board
1	Set of dry erase markers
30	Pieces 11 X 17 paper
30	Sets colored pencils / crayons
30	Glue sticks
30	Scissors

Anticipatory Set

Write the lesson objectives on the white board.
Discuss with the students what the objectives of the lessons are.

Objective: You will construct a collage to show mastery of the concepts presented from previous lessons.

Distribute handouts (or workbooks).



Introduction:

“Today we are going to make a collage. This collage will be used as an assessment instead of a test.”

“The project is going to cover all of the topics we have discussed so far. Let’s take a look at what is expected.”

Modeling / Guided Practice

1. Have the students focus their attention on the handouts (workbook).
2. Discuss what the final product (collage) should look like.
3. Present and discuss the rubrics that will be used to assess the student’s work.
4. Pass out the paper, glue, scissors, and magazines.
5. Allow the students the rest of the class period to complete the brochures.
6. Remind the students to carefully read and follow the rubric.
7. Scaffold for support.

Closure:

1. Have the students clean up.
2. **The lesson will be continued next class period.**

Independent Practice

1. Not applicable for this lesson.

Objectives: You will create a collage titled “An Exploration of Solid Waste”.

Topics to be covered by the collage:

- **Landfills—waste management**
- **Waste Decomposition**
- **Waste Reduction**
- **Waste Re-use**

1. Select one sheet of green 11” X 14” paper.
2. Divide the paper into 4 equal sections.
3. Label each section with one of the four topics listed above. Each section should have a different topic.
4. Find **3** pictures in a magazine that you feel represent or depict some aspect of the topic in some way. Glue / paste these 3 pictures onto the paper in the appropriate section.
5. Label or write about each picture with an explanation as to why you chose the picture, or what it represents about the topic..

Please refer to your notes if you have any questions about the content covered.

Please refer to the rubric if you have any questions about how the collage will be graded.

Lesson 7

Warhol Waste

“An Exploration of Solid Waste” Collage Rubric**General appearance and setup**

	0	Needs Work 1	Approaching Expectations 2	Meets Expectations 3	Score Received
Paper divided into 4 equal sections	No division	Paper divided into 2 equal sections	Paper divided into 3 equal sections	Paper divided into 4 equal sections	
Proper use of spelling, grammar, and punctuation.	Contains more than 3 errors	Contains 2-3 errors	Contains 1 error	No errors	
Each section labeled properly	No labels	1 OR 2 sections labeled properly	3 sections labeled properly	4 sections labeled properly	

Topic: Landfills—waste management

	0	Needs Work 2	Approaching Expectations 4	Meets Expectations 6	Score Received
Appropriate pictures representing topic	Does not contain any appropriate pictures	Contains 1 appropriate picture representing topic.	Contains 2 appropriate pictures representing topic.	Contains 3 appropriate pictures representing topic.	
Pictures labeled as to why the picture was chosen	Does not contain any appropriate explanation.	Contains 1 appropriate explanation.	Contains 2 appropriate explanations.	Contains 3 appropriate explanations.	
Proper use of spelling, grammar, and punctuation.	Contains more than 3 errors	Contains 2-3 errors	Contains 1 error	No errors	

Lesson 7

Warhol Waste

Date: _____

Topic: **Waste Decomposition**

	0	Needs Work 2	Approaching Expectations 4	Meets Expectations 6	Score Received
Appropriate pictures representing topic	Does not contain any appropriate pictures	Contains 1 appropriate picture representing topic.	Contains 2 appropriate pictures representing topic.	Contains 3 appropriate pictures representing topic.	
Pictures labeled as to why the picture was chosen	Does not contain any appropriate explanation.	Contains 1 appropriate explanation.	Contains 2 appropriate explanations.	Contains 3 appropriate explanations.	
Proper use of spelling, grammar, and punctuation.	Contains more than 3 errors	Contains 2-3 errors	Contains 1 error	No errors	

Topic: **Waste Reduction**

	0	Needs Work 2	Approaching Expectations 4	Meets Expectations 6	Score Received
Appropriate pictures representing topic	Does not contain any appropriate pictures	Contains 1 appropriate pictures representing topic.	Contains 2 appropriate pictures representing topic.	Contains 3 appropriate pictures representing topic.	
Pictures labeled as to why the picture was chosen	Does not contain any appropriate explanation.	Contains 1 appropriate explanation.	Contains 2 appropriate explanations.	Contains 3 appropriate explanations.	
Proper use of spelling, grammar, and punctuation.	Contains more than 3 errors	Contains 2-3 errors	Contains 1 error	No errors	

Topic: **Waste Re-use**

		Needs Work	Approaching Expectations	Meets Expectations	Score Received
	0	2	4	6	
Appropriate pictures representing topic	Does not contain any appropriate pictures	Contains 1 appropriate picture representing topic.	Contains 2 appropriate pictures representing topic.	Contains 3 appropriate pictures representing topic.	
Pictures labeled as to why the picture was chosen	Does not contain any appropriate explanation.	Contains 1 appropriate explanation.	Contains 2 appropriate explanations.	Contains 3 appropriate explanations.	
Proper use of spelling, grammar, and punctuation.	Contains more than 3 errors	Contains 2-3 errors	Contains 1 error	No errors	

“An Exploration of Solid Waste” Collage Rubric
Score Sheet

General appearance and setup	Points earned:
Landfills—waste management	Points earned:
Waste Decomposition	Points earned:
Waste Reduction	Points earned:
Waste Re-use	Points earned:

Total points earned:	Total possible: 81	Percent:
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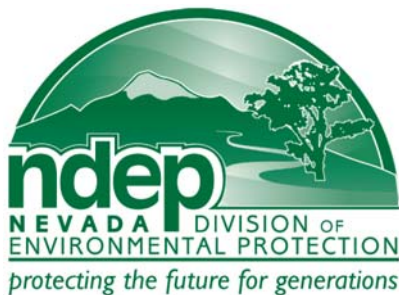
Solid Waste and Recycling Curriculum

Lesson 7

Warhol Waste

Name: _____

Date: _____



Lesson 8

Warhol Waste

Art Project / Assessment
Day 2

Support Document	Teaching Strategies	M1-137
Lesson 8	Lecture / Activity	M1-139
Support Document	Puzzles	M1-142
Support Document	Student Worksheets	M1-145

Teaching Strategies

Warhol Waste

Art Project / Assessment Day 2

Teaching Strategies

Small Group Discussion / Work

For below level learners and special ed, the teacher may consider grouping the students together. Read the instructions / rubric aloud and discuss. Help them put their thoughts on paper.

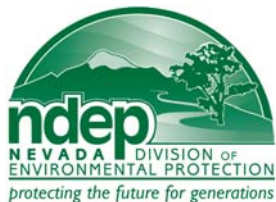
The discussion of individual questions/topics will allow all students to participate. It will also allow individual students to hear another classmate's ideas in a more relaxed setting (they will not be afraid of sharing information).

Rubric

The use of a detailed rubric will allow the students to understand exactly what they are being asked to do. In this lesson, there is a rubric for each topic they are expected to cover.

The rubric will allow the instructor to easily grade the student's work. For more advanced classes, the instructor may want the students to grade their own work.

Tip: The student worksheet can be made as a transparency for group discussion.



Lesson Time:
60 minutes

Warhol Waste

Art Project / Assessment
Day 2

Continue to...

Make Andy proud.

Objective

Students will finish constructing a collage to show mastery of the concepts presented from previous lessons.

Materials Needed

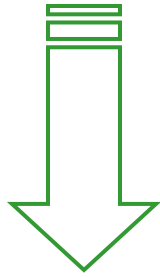
30	Workbooks (or handouts)
30	Magazines
1	White board
1	Set of dry erase markers
30	Pieces 11 X 17 paper
30	Sets colored pencils / crayons
30	Glue sticks
30	Scissors

Anticipatory Set

Write the lesson objectives on the white board.
Discuss with the students what the objectives of the lessons are.

Objective: You will finish constructing a collage to show mastery of the concepts presented from previous lessons.

Distribute handouts (or workbooks).



Introduction:

“Today we are going to finish making our collages.”

Modeling / Guided Practice

1. Have the students focus their attention on the handouts (workbook).
2. Discuss what the final product (collage) should look like.
3. Present and discuss the rubrics that will be used to assess the student's work.
4. Pass out the paper, glue, scissors, and magazines.
5. Allow the students the rest of the class period to complete the brochures.
6. Remind the students to use the rubrics as a guide.
7. Scaffold for support.
8. If the students have time, have them complete the recycle games on the following pages.




Closure:

1. Prepare the students for the next class' topic.



Independent Practice

1. Not applicable for this lesson.
- 

Support Document

Puzzle Solutions


Recycling Vocab Search

```

G M K O H V K L O E K F S C I
R S Y C V D L H G S A C N H B
R R F S P I T C W O I E E Z W
M E J O F R O S S P E C E P U
Q Q T D K M E N F M E H R G D
F T N A P E W G G O T A G I U
F A Q O W O C R D C W F B B O
L S S P R D T U U E A O L J Q
S T Z B L E N G D D V R R S R
V H E G Q A M U H E C E M M G
M W N D C M S N O A R C B P S
R E U S E V Z T L R U Y G A N
L E A C H A T E I L G C S P Q
B G M M U Q Q D R C M L U E Z
I E X H R O S R O T C E V R W

```

BROWNS
 COMPOST
 DECOMPOSE
 GREENS
 GROUNDWATER
 LANDFILL
 LEACHATE
 PAPER
 PLASTIC
 RECYCLE
 REDUCE
 REUSE
 VECTOR
 WORMS

Created by Puzzlemaker at DiscoverySchool.com


Recycling Vocab Search Solution

```

G + + + + B + L E D S + + + +
+ R + + R + A + L E + M + + T
R + O O + N + + C C + + R S +
+ E W U D + + + Y O + + O O +
+ N D F N + + + C M + P + + W
S + I U + D + + E P M + + + G
+ L + + C R W + R O E S U E R
L C + + + E + A C S + + + + E
+ + I + + P + + T E + + + + E
+ + + T + A + + V E C T O R N
+ + + + S P + + + + R + + + S
+ + + + + A E T A H C A E L +
+ + + + + + L + + + + + + +
+ + + + + + P + + + + + + +
+ + + + + + + + + + + + + +
  
```

(Over, Down, Direction)

BROWNS (6, 1, SW)

COMPOST (9, 8, NE)

DECOMPOSE (10, 1, S)

GREENS (15, 6, S)

GROUNDWATER (1, 1, SE)

LANDFILL (8, 1, SW)

LEACHATE (14, 12, W)

PAPER (6, 11, N)

PLASTIC (8, 14, NW)

RECYCLE (9, 7, N)

REDUCE (1, 3, SE)

REUSE (15, 7, W)

VECTOR (9, 10, E)

WORMS (15, 5, NW)

Recycle Cryptogram

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

7 19 16 9 9 20 11 2 11 13 17 11 26 10 21 15 10 9 11 9

Created by [Puzzlemaker](#) at [DiscoverySchool.com](#)

Solution:

Glass never decomposes

Recycle tiles

N E R	D F I	I T A	S T E	R Y	L L S	S A N	M
L A N	U S	E A	L I	S Y			

Unscramble the tiles to reveal a message.

Created by [Puzzlemaker](#) at [DiscoverySchool.com](#)

[DiscoverySchool.com](#)

Solution:

Sanitary landfills use a liner system.

Objectives: You will finish creating a collage titled “An Exploration of Solid Waste.”

While continuing work on the collage, please refer to the rubric presented in Lesson 7.

Please solve the following puzzles if you have completed your collage.

Recycling Vocab Search

G	M	K	O	H	V	K	L	O	E	K	F	S	C	I
R	S	Y	C	V	D	L	H	G	S	A	C	N	H	B
R	R	F	S	P	I	T	C	W	O	I	E	E	Z	W
M	E	J	O	F	R	O	S	S	P	E	C	E	P	U
Q	Q	T	D	K	M	E	N	F	M	E	H	R	G	D
F	T	N	A	P	E	W	G	G	O	T	A	G	I	U
F	A	Q	O	W	O	C	R	D	C	W	F	B	B	O
L	S	S	P	R	D	T	U	U	E	A	O	L	J	Q
S	T	Z	B	L	E	N	G	D	D	V	R	R	S	R
V	H	E	G	Q	A	M	U	H	E	C	E	M	M	G
M	W	N	D	C	M	S	N	O	A	R	C	B	P	S
R	E	U	S	E	V	Z	T	L	R	U	Y	G	A	N
L	E	A	C	H	A	T	E	I	L	G	C	S	P	Q
B	G	M	M	U	Q	Q	D	R	C	M	L	U	E	Z
I	E	X	H	R	O	S	R	O	T	C	E	V	R	W

BROWNS
 COMPOST
 DECOMPOSE
 GREENS
 GROUNDWATER
 LANDFILL
 LEACHATE
 PAPER
 PLASTIC
 RECYCLE
 REDUCE
 REUSE
 VECTOR
 WORMS

Recycle Cryptogram

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

7	19	16	9	9	20	11	2	11	13	17	11	26	10	21	15	10	9	11	9
---	----	----	---	---	----	----	---	----	----	----	----	----	----	----	----	----	---	----	---

Recycle tiles

N E R	D F I	I T A	S T E	R Y	L L S	S A N	M
L A N	U S	E A	L I	S Y			

Unscramble the tiles to reveal a message.